ELECTRICAL REVIEW

[ILLUSTRATED.]

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LONG DISTANCE TELEPHONING.

THE EXPENSIVE ENTERPRISE THAT THE AMERICAN TELEGRAPH AND TELEPHONE COMPANY WILL SOON HAVE COMPLETED—DETAIL OF THE LINE AND CABLE WORK.

The American Telephone and Telegraph Company, of this city, is a corporation organized by the American Bell Telephone Co. for the purpose of placing the large cities of the country in prompt and satisfactory telephonic communication, the first complete system having been constructed between New York and Philadelphia, a distance of 100 miles. There has been expended by the company, up to the present time, over $200,000, which can be taken as an evidence of the faith the promoters of the plan have in the success of the enterprise The president of the "long-distance" telephone company is Mr. T. N. Vail, and the general manager is Mr. E. J. Hall, Jr., formerly of the Buffalo Telephone Company. The work has been done under the specifications of Mr. T. B. Doolittle, of the Bell Company.

In the intricate and delicate work of testing every line and cable, and discovering and locating all escapes and slight defects, General Manager W. D. Sargent, of the New York and New Jersey Telephone Company, has been of invaluable assistance to the company. In this work he was ably assisted by electrician John Barrett, of Brooklyn. The General Superintendent of Construction of the American Company is Mr. W. H. Fairbanks, an experienced telegraph construction man, whose work has been most satisfactorily done.

The history of the inception and gradual advance of this development of the telephone is replete with interest. The first attempt to connect Eastern cities by telephone was made some four years ago by a company known as the Inter-State, which constructed an iron wire between New York and Boston, which failed, however to work satisfactorily. Two years ago the American Bell Company erected a metallic circuit of hard-drawn copper wire on the poles of the Inter-State Company, for the purpose of testing copper wire for long-distance use. The experiment with the Blake transmitter demonstrated that this wire would work satisfactorily electrically, and then followed tests for discovering the best method of manufacturing the wire so that it would stand. The result of all this pioneer work was the organization of the company, as stated above, with means and ability to push the work rapidly and intelligently The present construction extending between New York and Philadelphia was begun in August, 1885. When the wires were strung, the very important question as to whether there would be cross-talk between the metallic circuits was answered—and in the affirmative. This had to be overcome, for the promoters of this work realized that there should not be the slightest noticeable induction or interference if the long-distance telephone work was to attain the magnitude intended and secure the popularity necessary to make it a commercial success. This result, after much experimenting, was secured by an arrangement of the wires that secures an electrical balance between the circuits.

It will not be out of place to state here that every individual connected with the construction has had a personal interest in it, and all are entitled to considerable pride in the electrical and mechanical success of the venture, as now proven. A new era in business transactions between cities is now to be introduced, and while it is not wise to predict, yet it would seem that its success commercially is only a matter of a few weeks' time, which will see the Philadelphia system connected with these long-distance cables, which are now asking for entrance into that city.

THE POLES AND CROSSARMS.

The poles and crossarms were carefully selected and rigidly inspected, and the utmost diligence was observed in carrying out Mr. Doolittle's specifications relating to the construction. The poles are chiefly of chestnut,

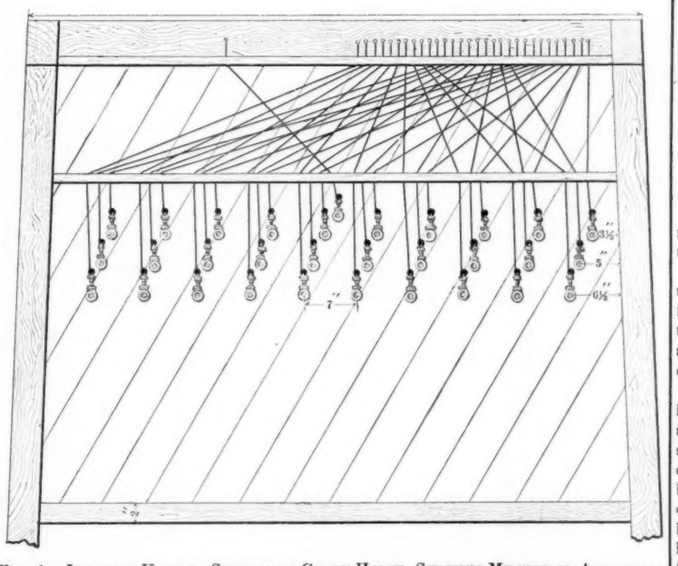


FIG. 1.—INTERIOR VIEW OF SECTION OF CABLE HOUSE, SHOWING METHOD OF ATTACHING THE WIRES, ADOPTED BY THE AMERICAN TELEGRAPH AND TELEPHONE CO.

45 to 70 feet in length, seven inches at the top, secured by a substantial iron ring with a heavy top pin, to which is attached a No. 8 iron guard wire. Seven gains are cut in all of the poles, three of which are occupied by ten pin cross arms $3\frac{1}{2} \times 4\frac{1}{2}$, braced the entire length of the line from New York to Philadelphia with the Haskin's brace. The poles are planted at a depth of from six to eight feet, pointed at the bottom. The guy wires are of wire rope, anchored to large boulders buried deeply in the ground. The insulators are known as the "screw top," and the pins of split white oak timber.

THE WIRES.

There are at the present time twenty-four hard-drawn copper wires strung the entire distance of 100 miles, making a total length of 2,400 miles of copper wire. The sizes are Nos. 12, 14 and 16, new British gauge, the different sizes being put up for the purpose of securing a practical test of their respective merits. The outlay for the wires alone has been a very great sum, but no cheaper wire was considered, as the advantages of hard-drawn copper for long-distance work has become too well-known to admit of any other kind being thought of for such an important work.

THE CABLES.

Between the cities of New York and Philadelphia six series of submarine cables are used in the various rivers, amounting to a total length of twenty miles of seven-wire kerite cables. These cables were specially manufactured for this work by Day's Kerite Company, the longest stretches of cable being required to cross the North and Delaware rivers. These cables terminate at the foot of Vesey street, in New York, and at a point near the foot of Walnut street, in Philadelphia. From the New York landing the wires are carried to the central office on Fulton street by ærial cable from the same manufactory, this office being connected with the New York telephone system.

THE CABLE HOUSES.

These are of novel and most convenient pattern, framed of wood, with bias sheathing covered with waterproof paper, and clapboarded over all. With their shingled-hipped roof they are as impervious to water as a dwelling house.

There are two stories or floors, the first, about five feet in the clear, used for the storage of materials, etc., and the second about seven feet. The second floor, of which we give a side view in Fig. 1, is reached by a vertical ladder through a trap-door, and here, high and dry, are located the lightning arresters, wires, etc. Near the center of this space is an upright framework, covered with matched sheathing, upon which the lightning arresters are fixed. To the right of the arresters is placed a telephone set for the inspectors use in testing the wires, shown in Fig. 3 on the following page.

A shelf is fixed at a convenient height, upon which are arranged a row of cords, plugs and weights, for the purpose of connecting the telephone set, and for cross-con-

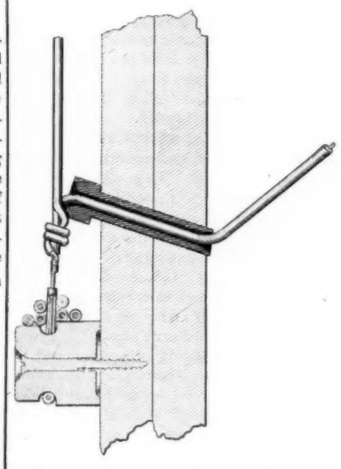


FIG. 2.—ENLARGED VIEW OF SINGLE CONNECTION.

necting or "patching up" wires in case of trouble.

A long slot is cut in the sheathing back of the lightning arresters, which emits light from the window, and enables the inspector to discover any trouble which may have arisen from a heavy discharge or other cause.

Kerite or okonite-covered wires are taken in regular order from the lightning arresters and carried over the top of the frame by the side of the house, and then taken through cleats to their proper positions on porcelain insulators, which are arranged on the inside of the houses, and sufficient quantity of wire is wound around itself—section view of this is seen in Fig. 2, at top of insulator—to serve for future needs. Covered wire is brought from the line through rubber tubes, set at an angle in through the side of the house. A sectional view of tube is shown above. They are then brought down to a point just above the porcelain insulator, when the inside wire is bared and a connection is made. This connection is afterwards covered with kerite tape, therefore it will be seen that there are no uncovered points for escape except the rubber surface of the lightning arresters, and the favorable position of those eliminates any danger at that point.

There are three windows, one on either side, and one directly behind the lightning arresters, for the purpose described above. The windows are protected by hinged battened blinds, which close tight and are securely bolted.

The floor space inside is 7x7, making a snug little room.

THE LIGHTNING ARRESTERS.

The copper conductors, of which the line wire is composed, afford an excellent thoroughfare for heavy electrical discharges.

Therefore the lightning arresters, at the cable houses, have been designed with special regard to the extraordinary work which they have to perform, and the detail of their construction presents many novel, interesting and valuable points.

A glance at the engravings, on pages 2 and 3, and 6 and 7, with the following brief description, will enable our readers to fully understand these peculiarities.

The arresters are constructed in groups of ten, and so arranged as to be conveniently joined together to an unlimited extent. The backboard is an oblong mahogany frame upon which are screwed firmly two hard rubber plates one-quarter inch in thickness, shown in black in the cross section, Fig. 6. Upon these plates are placed the heavy brass mountings to which the line and cable wires are attached. By this means the leakage caused by the absorption of moisture by the wood (as in the ordinary method) is avoided. The leakage must come exclusively from the surface, which is ordinarily dry.

A fine galvanometer test shows no escape, but a breath on the surface will deflect the needle. A heavy brass "ground bar" passes down the center, to one side of which is presented the line points in the form of saw teeth. This bar is connected to the ground by a very large copper wire. These points are also very heavy and are intended to afford protection from the outside line, by furnishing ample means of escape for heavy discharges as well as to relieve the fuse wire from overheating.

The fuse wire is of soft silk-covered copper .008 inch diameter, and coated with a solution of "okonite." This wire shows an insulation of one-half megohm per 1,000 feet after 20 hours immersion in water.

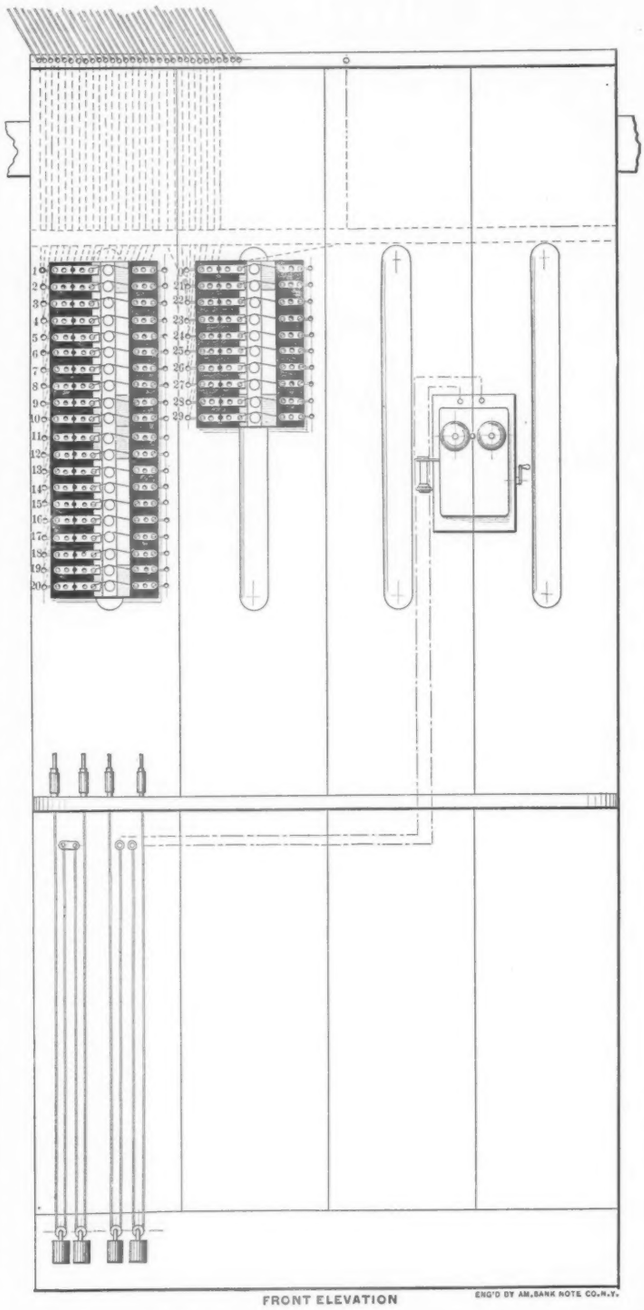
One end of the fuse wire is attached to the screw head on line point, then passed once around the brass stud in the "ground plate," and separated therefrom by paraffine paper, then passed under the screw head on the cable point and drawn taut.

The line points are in two pieces, and are connected by a screw plug (shown in Fig. 7), which provides an excellent electrical connection, and is an absolute guard against "working loose" or dropping out as in the case of taper plugs.

The plugs are provided with a coarse thread, consequently the same amount of turning required to set a taper plug will send them home.

This arrangement of arresters is free from the defect common to nearly all that have an obscure un-get-at-able point to be neglected or overlooked by the inspector. A glance will suffice to detect any trouble with the system.

The removal of the screw plug opens the line, and the holes drilled and tapped in both the line and cable points (indicated in the arrester cut) enable tests to be made in either direction instantly and without disturbing the wires.



FRONT ELEVATION ENG'D BY AM. BANK NOTE CO. N.Y.

FIG. 3.—SHOWING ARRANGEMENT OF LIGHTNING ARRESTERS IN THE CABLE HOUSES OF THE A. T. & T. CO.

How to Bury the Wires in New York City.

The three members of the New York Electrical Subway Commission appointed to devise and carry into effect a plan for burying the aerial wires of every description, held an important meeting last week. Hon. Roswell P. Flower, as a committee of one, had prepared a paper setting forth his ideas of how the problem should be worked out, and read it to his associates, Jacob Hess and Theodore Moss.

He presented for the consideration of his colleagues—Commissioners Moss and Hess—a carefully drawn detailed report, reviewing the work done and to be done by the commission, which he followed with resolutions that practically settle for good the most vexed question that has arisen—the basis of the plan to be used for burying the wires. In brief, that plan provides practically for an asphalt or bituminous concrete conduit, with convenient manholes through which insulated wires and cables can be readily drawn in and out.

Nearly 150 plans and models have been submitted to the commission, said Mr. Flower in his comprehensive report, including 10 tunnel systems, 10 conduits formed from iron tubes or sections, 20 conduits formed from concrete, wood, or masonry, 20 sidewalk or gutter systems, 12 permanently imbedded wire systems, and 12 cables and insulating compounds. Commissioner Flower told of the investigations made by himself and colleagues of working systems in Chicago, Philadelphia, Brooklyn, Washington, Boston, and Detroit, as well as of systems accepted in other countries. Five general systems as to mechanical construction exist for subways—the tunnel system, the "drawing in" system, the solid system, the "dropping-in" system, and the combined system. The report continued:

"Tunnel systems, or those where space is provided underground sufficient to allow the passage to and fro of men who place the wires within the subway, could be recommended were unlimited time and money at the disposal of the commission; but the expense of such a system, and the crying need of immediate action, preclude the adoption of such a plan. If ever underground railroads become a feature of our city transportation, then, perhaps, the tunnel can be used for some of the future trunk-line cables. In Paris, where the foundations of the city are honeycombed in all directions by large sewers, such a plan is practicable and admirable, but not to be thought of in New York.

"Drawing-in systems, or those where manholes are provided in the streets, connected by tubes or pipes through which the wires can be drawn, are next in prominence and convenience to tunnel systems. In Chicago there were seen in successful operation nearly twenty miles of conduits of the 'drawing-in-and-out' pattern of various material, containing all kinds of wires, as follows: Eight miles of the Dorsett system of concrete conduit divided into ducts, and containing in the separate ducts wires of the city telephone, telegraph, and fire service, electric light wires, and wires of different telegraph companies. Four miles of the Johnstone system of iron conduit divided by metal shelves, and carrying the wires of the Postal Telegraph Company. One mile of 3-inch iron pipes, four in number, carrying the wires of the Western Union Telegraph Company. Three miles of iron pipes, carrying the wires of the Bankers and Merchants Telegraph Company. In Philadelphia a comprehensive 'drawing-in' system of iron was seen, containing electric light and telephone and telegraph wires. In Boston some two miles of such 'drawing-in' iron systems are in operation. In London 9,000 miles of wire are under ground, bunched into cables and drawn into 3-inch iron pipes."

Solid systems were also found in successful operation in Chicago, Washington, this city and elsewhere, and, says Mr. Flower in his report, pointedly:

"I am convinced that from the standpoint of an electrician simply it may be said that almost any plan or system can be made to work; from a single lead-covered wire laid directly into the earth, to a great tunnel upon whose walls the isolated conductors can be hung. Within certain broad limits any system is electrically practicable; retardation and induction can be overcome. It is only when we face in this city the mechanical, engineering, and chemical questions of interference with water pipes, gas pipes and sewer pipes, of obstructions from vaults, of danger from steam pipes, of the action of sewer and illuminating gas, that the necessity of careful discrimination presents itself.

"In the future, when the uses of electricity become more general, and its nature better known, it may be that the city of New York will absolutely require a grand electrical underground highway, where space can be provided for the conducting and distributing of sufficient power to run all the engines and work all the machinery within the city limits. It may be, and probably will be, that before such space is needed much more will be known of the qualities of different forms of electrical conductors, and of the best methods of carrying them underground, and that the matter of electrical subways will be no longer experimental, but practically demonstrated in every detail. When such a time comes the commission or other authority will determine what is required to meet the necessities of the occasion. The responsibilities of the present commission begin and end with providing for the requirements of their own day, and for such of the exigencies of the future as they can reasonably anticipate.

"Leaving out of consideration all tunnel systems as too expensive, we must also discard any system which calls for the simple laying of insulated cables in the earth. They would not stand the chemical action of the gases and acids; the streets would be continually torn up for new connections and repairs. We are thus shut up to the question of electric subways or conduits in which the wires or cables, insulated or otherwise must be placed, and which once laid down should meet all the demands of the present and near future.

"Of conduits, it may be safely predicted that, so far as the experience of this and other cities is a test, some form or other of a 'drawing-in' system is most convenient. The life of the best cable is by no means satisfactorily decided, and, of any particular cable, to predict how long it would last, would be purely speculative. Of wires not contained in cables it may be said that they are equally more uncertain in their length of life and usefulness. At all events, for purposes of distribution, it is desirable that the wires should be easily approached at frequent intervals, and the commissioner cannot countenance any plan that looks to the disturbance of pavements more than is absolutely necessary. It may be that through lines of wire would be better protected laid in permanent beds of insulating material, but a 'drawing-in' conduit system allows space to be provided for new wires without the frequent tearing up of pavements. The commissioners can, therefore, give their approval to a 'drawing-in' system, with frequent manholes, as the general form of subway best adapted to meet the requirements of the electrical service of the present."

Regarding the question of material for use in conduits, Commissioner Flower quoted a report made by Dr. Albert R. Ledoux, an expert chemist, who, in summarizing the results of his investigations, said:

"After hearing all arguments and careful consideration, I give my unqualified approval to an asphalt concrete conduit, provided it can be made of sufficient strength and durability, can resist the action of acids, alkalies, and gases, and can be made gas and water tight, and be in itself an insulator. I will frankly state that I have been led to this conclusion reluctantly, against my preconceived ideas, and solely by my tests, after consulting the best disinterested available authorities in this country. I had until I began this investigation the idea that an iron pipe, because now most largely used to hold a simple cable, would, enlarged, be the best form and material for a conduit."

Dr. Ledoux finds that asphalt conduits can be made at from one-half to one-tenth the cost of iron ones; that iron under ground in many parts of New York is subject to rapid detorioration from rust, the action of salt water, etc., that the breaking of wires or the abrasion of the insulating material with which they may be covered in an iron conduit will at once "ground" a wire. Dr. Ledoux said:

"In addition, should the insulation be weakened upon a conductor carrying the current of an arc electric light, and should this wire thus exposed come in contact with an iron pipe carrying telephone wires, or even telegraph wires, not perfectly insulated, a destructive connection is possible, which might not only injure the smaller wires, but lead into every office or every house where the telephone or telegraph wires entered a current which is at once dangerous to life, and also liable to set fire to the structure."

Dr. Ledoux also urged against iron conduits that iron is at a disadvantage, because of its great expansion and contraction when filled with insulated wires, and that an iron conduit cannot be subdivided into separate chambers for different wires without increasing the cost more rapidly than in other materials. Experiments are detailed to show what he holds to be the superiority of an asphalt concrete for the purpose desired. These experiments prove, he says, that an asphaltic or equivalent concrete can stand every ordeal and meet all requirements. One special advantage that he accords to an asphaltic concrete is the readiness with which the shape of a conduit can be changed to suit any locality, the ease of its repair, and its durability under the conditions of New York streets.

In addition to the Ledoux report, Commissioner Flower also presented "the report of a general committee of the different electrical companies furnished and vouched for by President Morton, of Stevens Institute, Hoboken, to the same effect—that insulating materials are preferable for conduct purposes to iron tubes." This document, dated March 15, 1884, is signed by Henry Morton, Chairman, and William C. Behrens, Secretary. Further to show the thoroughness with which he had pressed his investigations, Commissioner Flower offered an elaborate report from John Thompson, the commission's own expert electrician, against iron and indorsing an asphaltic concrete. In conclusion Mr. Flower set forth these general principles as being satisfactory to him as the result of investigations:

"That any kind of conduit which will protect the insulated wires will answer; and, on the other hand, that no known conduit has yet been found which works perfectly, or is an ideal one. It may be said with confidence that the weight of evidence before the commission is toward the use of an insulating material for conduits, and of isulating materials, asphalt or bituminous concrete has certain advantages over all others, viz.: It is cheap; it is durable; it is capable of standing harsh treatment; it can be easily and closely jointed; it can be made absolutely free from moisture, and free from contraction and expansion; it is a bad conductor of heat as well as of electricity.

"It is the part of the commission to the best of their information and belief the best and most convenient protection for the wires, and it is believed that this can be secured in an asphalt concrete 'drawing-in and out' conduit, and that in the material decided upon all the advantages known to exist in any system can be successfully combined. But in the same way as it has been said that for particular purposes or particular localities it may be necessary for the commission to depart from the drawing-in system, so it may be said that it may be necessary for them at times to depart from the asphalt concrete material. Iron pipes have two distinct advantages over the asphalt concrete which are indisputable. They are stronger and they are less bulky. If for special reasons extraordinary strength or compactness is preferable at special points to durability and insulating properties and cheapness, then the commission can at those points be compelled to modify their plan to suit the exigencies of the case and use iron."

Again, there are cases where it would be foolishness for the commission not to take advantage of certain circumstances which render a modification of their plan reasonable, as, for instance, where cable surface roads or underground roads are in process of construction, and where, for an outlay much less than that required to lay any kind of conduit, the commission can secure a space admirably adapted to their wants. In general, we may conclude that, while we approve the asphalt concrete drawing-in system, other things being equal, each particular specification of the commission will have to be governed by the circumstances of the case for which it provides.

When Commissioner Flower had finished reading his report, Commissioner Moss, after giving the result of his personal investigations, moved that it be adopted as the official report of the commission, and this was unanimously agreed to. Then these resolutions,

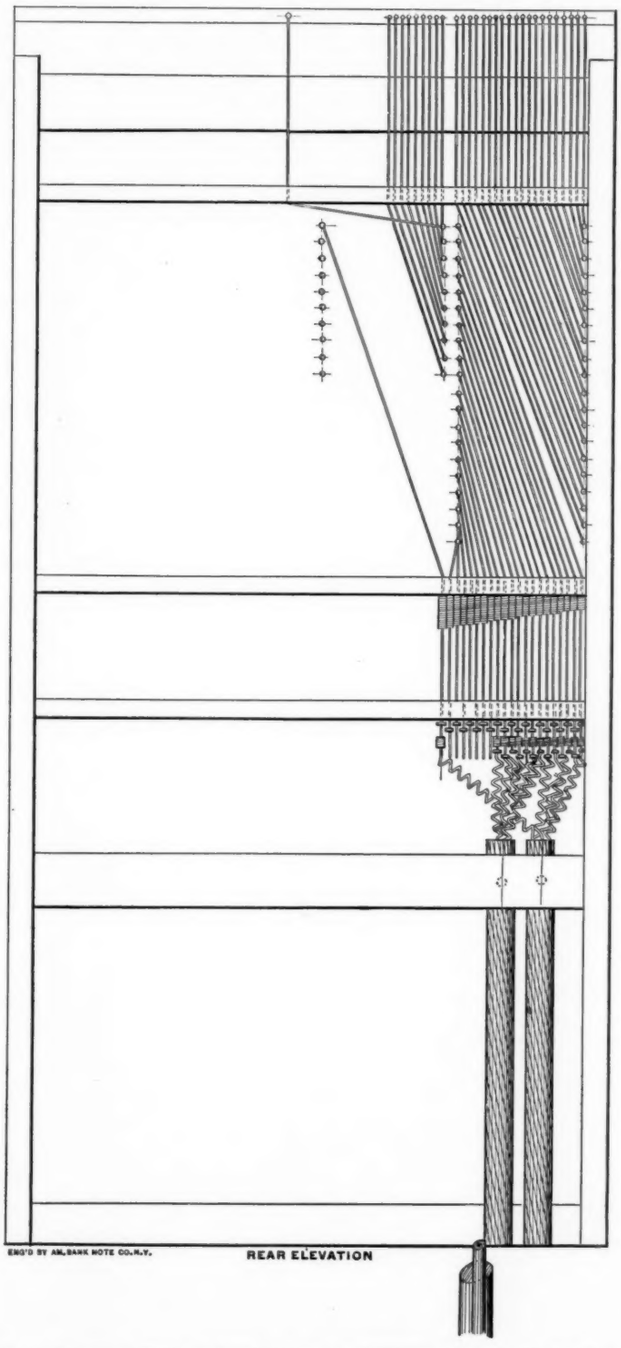


FIG. 4.—SECTIONAL VIEW OF ARRANGEMENT OF LIGHTNING ARRESTERS AND WIRES.

on Mr. Flower's motion, were adopted, more specifically declaring the purposes of the commission:

Resolved, That the commission, in view of all the information they have been able to acquire on the subject, favor a subway which shall in the main conform to the following conditions: Its material shall be an asphalt or bituminous concrete, which shall be capable of sustaining the following tests: It should contain a crushing test of 4,000 pounds per square inch, and have a tensile strength of not less than 300 pounds per square inch of section; it should not crack when submitted to a temperature of 10° nor lose its shape at 200°; it should not soften below 160°; it should resist the action of organic acids and illuminating gas, and should not disintegrate under the action of salt water; the pitch or asphalt used should be inspected before it enters into the concrete, and be pliable at 150°, but brittle below that temperature. It should not be heated above 325° in boiling, the sand used should be silicious, and the porosity of each lot carefully determined so as to insure the perfect cohesion of the mass, with no excess of plastic material. But this shall not prevent the use of any other material where the special exigencies of particular electrical services or of particular localities render it advisable in the opinion of the commission. Its form shall in general be that of a conduit, with convenient manholes where cables and insulated wires may be readily drawn in and out of distinct ducts in the conduit; but this shall not prevent the laying of wires in other ways where for special reasons it may seem desirable to the commission.

Resolved, That Mr. Thomson, the mechanical expert of the commission, be called upon to report at the next meeting of the commission such data as he has collected as to the elaboration of the plan necessary in providing for different classes of wires, and the mode of distribution best adapted to the wires of different electrical service.

Resolved, That the engineer of the commission be called upon to report at the next meeting of the commission such data as he has collected as to the capacity of conduit required for different classes of wires in different parts of the city, and the order in which different parts of the city can be most conveniently supplied with subways.

This further resolution on Mr. Flower's motion was also agreed to:

Whereas, The commission have no funds, and there are no means at present existing by which such funds can be raised by the commission, and

Whereas, It is important that the placing of wires underground shall begin at the earliest moment possible, and

Whereas, The commission are advised by the Attorney-General of the State that they may properly engage with a construction company for the performance of this work.

Resolved, That the counsel of the commission be called upon to report at the next meeting of the commission generally as to a company to lay, operate and maintain the subway under the direction and control of the commission, and to suggest to the commission all necessary legal precautions and safeguards in the government of such company, with a general plan of contract to be made by the commission with such company, which plan, before it is adopted by the commission in any form, shall be submitted to the Attorney-General for his official criticism.

On motion of Commissioner Hess, Henry S. Kearney was appointed associate supervising engineer of the commission, and Daniel L. Gibbons was made counsel of the commission. The commissioners meet again on Tuesday, July 13.

An Electric Traveling Crane.

An electric traveling crane is now at work at the warehouses of the Compagnie des Entrepots et Magasins Generaux, at Roubaix, France. At these warehouses the cotton bales arrived mostly from America and La Plata are stored before being forwarded to the different cotton mills. On account of the great fire risk no steam crane is allowed in the establishment, and the bales, which weigh about ½ ton each, had until recently to be hoisted and handled generally by manual labor. This work is now accomplished by a travelling crane worked electrically. The crane post is placed on a trolly which runs on rails, and a rail fixed to the ceiling of the warehouse guides the upper end of the post. The jib of the crane has a derrick motion. A small Gramme four horse-power dynamo is fixed on the trolly. This is always kept running (900 revolutions per minute), and being connected with suitable gearing, it can be made to hoist the load, advance the crane on the rails, and operate the jib. The current of 15 amperes, with an electro-motive force of 250 volts, is conveyed to the crane by overhead sliding contacts from the generator, which is a six horse-power Gramme dynamo running at 1200 revolutions per minute. The commercial efficiency of this arrangement is stated to be 60 per cent. It shows, however, an economy in working, for, whereas formerly 10 men were required to handle 150 bales in 18 or 20 hours, now with this electric crane four men can do the same amount of work in three hours.

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Competition in electric lighting is very sharp and close, but if this should result in interior work, the entire business will ultimately suffer. Every electric light man should stick a pin here.

The REVIEW publishes a very important digest in this issue pertaining to storage battery patents. There will be a series of these digests, which we are confident a great many of our readers will find to be valuable and authentic references. The dates and numbers of foreign patents are also included.

There is much that can be read with interest by the managers of the telephone companies in the account published in this issue of the work done by the American Telephone and Telegraph Company in the construction of its lines between New York and Philadelphia. This important work is being conducted carefully and intelligently, every step being thoroughly tested and proven, and the results cannot fail to be of great value to the telephone interests of the country.

THE ELECTRICAL SUBWAY COMMISSION'S REPORT.

The Electrical Subway Commission have at last made a preliminary report, which we publish in another part of the paper. As was expected, none of the one hundred and fifty plans which were submitted to them met their approval, and principally for the reason that not one of the plans was essentially practical and complete in all its details. The commissioners, after careful examination and consultation with experts, have come to the conclusion to pick out the best features of all the different plans, and to recommend the system so made up.

As a preliminary thereto, they find that a conduit made from insulating material, such as concrete, asphalt, or bituminous concrete, and so arranged that the wires or cables can be conveniently drawn in and out, will be used to the exclusion of all others, as they find that they are the cheapest, most durable, and essentially the most suitable of any that have been presented to their consideration.

The determinations of the commission have not advanced beyond this point; but they expect upon July 13th, after further consultations with their experts, to be able to suggest a comprehensive system in its entirety. The plan of the commission also involves the formation of a construction company which shall build the system and operate it.

Thus far it is satisfactory, and we hope the balance of the report relating to the details of the system will be equally so.

So far as the construction company is concerned, it is the only way to get the work done. Such a company should, however, be surrounded by every restraint to prevent it making extortionate charges that the law can provide, and which, in any case, should not exceed the cost for maintaining overhead wires.

The franchise should be sold at auction to the highest bidder, and an indemnity bond required to protect the city and those using the conduit from any claims or suits for the infringement of any patent, this being particularly necessary in view of the action of the commission in making up its system from the information imparted by the plans submitted by others.

MAKE BETTER TIME.

The recent conflagration of the Manufacturers and Mechanics' Institute Building at Boston, with its loss of life, destruction of valuable property, and enforced idleness to those employed there, all constitute deplorable incidents in this sad catastrophe. The building, formerly used for mechanic's fairs, has lately been occupied by the Metropolitan Horse Railroad Company for storage and repair of cars, and the fire started in an unoccupied portion of the building at about two o'clock, P.M. The flames spread rapidly and there was some delay in the arrival of the fire department, as four different boxes were struck, making a confusion in the alarm, and the department were obliged to wait until the proper number was struck on the public bells. But this is not all, there are two boxes bearing this fated number, 248, and the fire department first went to the repair shops of the Boston and Providence Railroad; and this duplication of numbers appears to be inexcusable. The general arrangement of Boston fire alarm circuits has been reputed to be excellent, particularly the attaching of alternate alarm boxes to different circuits, so that if one box fails to operate from any cause, it may be the fault of the circuit; if the operator runs to the next box, he alters both conditions which may have contributed to the previous failure, for this apparatus is both a different box and a different circuit.

In an able editorial on this fire, the Boston *Globe* says:

It would certainly seem as though the city of Boston ought at once to so improve its fire alarm machinery that no such delay could occur in future. Half a minute saved on this occasion might, perhaps, have prevented that never-to-be-forgotten scene at the window, where a poor human being perished by inches, within sight of the horrified lookers-on, before our gallant firemen could reach him. We presume there must be modern improvements in fire telegraphy which would make it impossible to mix up the alarms on the tappers in the engine houses, however many boxes may be pulled at or about the same time. Philadelphia, Washington, Baltimore and other cities claim to have such apparatus. We should have at least as good. Our fire commissioners and our fire department have a great of responsibility, and in return should be furnished with the most improved facilities for meeting that responsibility. They have a right to ask it, the great insurance interests have a right to ask it; humanity has a right to ask; and we believe that our taxpayers will look upon it as a wise expenditure to have it.

There is one other matter in regard to this fire which illustrates the sham of much of the fire apparatus emblazoned in public buildings. Visitors to the fairs held in this building will recollect how the fire hose was coiled at inside hydrants on the various columns of the building ready for use, after the most approved plan. When the Horse Railroad Company occupied the building the insurance companies required other measures of protection.

Since the fire it has been learned that the pipes leading from these hydrants were never connected with the city water mains in the street, and were therefore a delusion and a snare.

HOW TO RUN AN ELECTRICAL JOURNAL.

The ELECTRICAL REVIEW has always invited correspondence, and we get in the course of the year a good many letters from all sorts and conditions of people, and upon almost every subject. Every now and then we are treated to an essay on how to run an electrical paper. Somehow or other these effusions are always received after we have had occasion to tell some hard, solid truth about something or other. Our correspondents generally begin by informing us that our course is grieving our friends—(we always drop a tear at this point)—and that a continuance will cause the writer to discontinue his subscription, or remove his advertisement from our columns—(here we open the flood gates of repentance, and chain down the copy on the table lest it be swept off in the welling tide). We are then informed, however—(we take courage here)—if we will look more leniently upon the peculiar (often peculiar in more senses than one) and pet scheme of our correspondent that he will not take such harsh measures, but will let our transgression pass—(we hope again); that if we could see any one way to a notice or so in aid of his stupendous enterprise, why, there is no paper in the field of electricity that could expect to hope to even hold a candle to the ELECTRICAL REVIEW—(at this point we always feel gratified). We are always much obliged to such correspondents—more obliged than we can tell—but, there are always buts in this prosaic world, we really can't do it. It pains us to say it but we can't. We would like to say and feel that every enterprise based upon electricity and offered to the general public for investment was entirely legitimate, but we cannot. We would like to take the advice of all our correspondents as to how to run our paper, but we cannot. Consequently we have to use our own volition—trust to our own poor judgment, and go it alone. We may lose an occasional subscriber or an advertisement by our (wayward) course, still we hope to pull through, and like the old lady who, after being rescued from a runaway horse, and asked how she felt at the time, answered that she felt a trust in Providence until the breaching broke, and then she looked out for herself—*sic transit.*

CARELESS WIRING.

The past four years have seen great advances in both arc and incandescent electric lighting. Careful, painstaking investigation has led to many improvements in arc lamps, so that the old flickering light is now a rarity. Incandescent lamps are daily growing better, both in appearance and efficiency. In short there has been a decided advance in all directions except one, viz.: wiring. The old careless methods of five years ago are still employed, with a few exceptions, and very little attention seems to have been paid towards making any improvements. Why this should be we don't pretend to say, but the fact is evident to any one who will look into the matter, and we believe the subject should receive careful and immediate attention. Within the last few years several large installations have been removed from buildings in this city principally for the reason that the wiring was so imperfect, and leakage so enormous, that the cost of operation considerably exceeded that of lighting by means of gas. Our attention has been called to a number of instances where underwriters' wire, presumably water-proof, was laid in wet cement or mortar. The result being that the covering of the wire was attacked, destroying the insulation, the current being led off by the wet walls, which formed excellent conductors. Again, there is a great lack of care in making the connections of branch leads from the main conductors.

No insulation test made when the plant is not in full operation is worth anything. The resistance of a wire increases as it is heated, and an imperfect connection is often not noticed with an ordinary battery test. Again, switches, cut-outs and the like require to be frequently looked after to see that the contacts are good and firm, and that the rubbing surfaces of the switches are bright and close. All bright work oxydizes rapidly, and should receive careful inspection at least once a week.

Street wiring for arc work is also in a very crude state. In our opinion this very carelessness has, in a measure, influenced public opinion in favor of an underground system. We had occasion lately to visit a beautiful old town in central New York which has been rendered unsightly by the multitude of thick white wires stretched in every direction. An examination of the lines looked as though those having the wiring in charge had used positive ingenuity to make in all as unsightly as possible We noticed that in one block the wires (three) crossed and re-crossed the street in a zig-zag fashion no less than seven times, and for no other reason than to avoid large trees. Good insulated wire could have been carried through the branches of the trees without a particle of danger, and the usual appearance of the street would have been preserved. We do not see the sense of having outdoor wires white. Why can they not be covered gray or some similar invisible color.

The method of looping out arc lamps, now in vogue, is often electrically bad, and very often unsightly. We have seen the largest size of glass telegraphic insulator used as a break between the ends of the outgoing leads.

It seems strange that we, at this late day, should find it necessary to call attention to this most important question of wiring.

ELECTRICAL NEWS OF THE WEST.

Prof. John P. Barrett, who stands at the head of the Electrical Department of the city of Chicago, has, among the relics of old times, a badge he once wore when he was younger than he is now, the legend upon which tells that he was bell ringer number six.

The Professor was the father of the original idea of burying the wires, and the proposition was so obnoxious to the telegraph people hereaway, that a Western Union chief operator, who is now in his grave, gave to him the nickname of Ground Hog. The fight for supremacy was a long one, and several attempts were made before a final ultimatum was reached in the shape of an ordinance compelling the wires to go underground. It came, however, and there was no end of ingenuity displayed to evade the law and hamper the "ground hog." The Professor was equal to the emergency, and proved the old adage:

"For time, at last, sets all things even—
And if we do but watch the hour,
There never yet was human power
Which could evade, if unforgiven,
The patient watch and vigil long
Of him who treasures up a wrong."

However, the incentive to John was not entirely one of revenge. He did feel somewhat as if the bloated monopoly was stepping upon him, as it were. But there were more or less misunderstandings occuring between the linemen of the various companies and the city's employes almost daily, and it was easy to see that there was plenty of trouble brewing in the future. There was not room enough on the principal thoroughfares for the requirements of the case.

Before the passage of the ordinance La Salle street, opposite the Board of Trade, was so thoroughly bridged by wires that the street was visibly darkened by them, and lines of poles from eighty to ninety feet high were scattered throughout the south, north and west divisions.

The newspapers stirred up the matter, and the pro and con of the question was thoroughly discussed in all its bearings. The electricians announced that the placing of the wires underground would be a death blow to all telegraph and telephone enterprises, and finally it occurred to someone to suggest to the city that it should take its own doctor stuff—if it was good for the goose it should be proper for the gander.

There was no money with which to bury the city wires, and for a long series of months the Professor was jeered and laughed at by his persecutors for his inconsistency.

Finally, he made arrangements through which a part of the regular appropriation for his department was set aside for the purpose, and when the old rookery was abandoned, and the instruments were removed to the new City Hall, all the city's wires from the river south to Harrison street were put out of sight.

The ordinance took effect May 1st, 1883, and, in order to hold their own against the city, the companies took out an injunction restraining the city from interfering with work already up, claiming protection on the ground of rights under former franchises. No objection was made to this by the patient watcher, but ere long the companies' employes were found doing work which was not provided for by the injunction, and which was contrary to the ordinance. To use a phrase which pertains to that sort of doings, "they were scooped and mulcted."

This was a kind of warfare for which the companies were not quite prepared; and, as the necessities of the case constantly required this sort of wire changing, and as they were as constantly being "run in," the game, what little there was of it, became quite expensive.

The companies were fairly worsted, and compelled, whether or no, to give up some privileges in order to obtain others. Little by little they gave up their vaunted rights, and accepted in their stead other temporary privileges, to hold these latter at the mercy of the authorities.

The question, so repeatedly asked, "Why doesn't Chicago bury her wires?—she has a law compelling every wire to go underground which took effect three years ago"—is answered above. There has been no trouble in accomplishing the result so far, and there will be none. In less than two months there will be no telegraph or telephone pole on the South side streets north of Van Buren street. The professor says:

"The greatest trouble, perhaps, has been and will be the work of changing the wires of the Chicago Telephone Company, but a beginning has been made. They have already planted the trunk line wires connecting the South side office with the main offices on the West and North sides, and are engaged in putting down a conduit that will take this same class of wires as far south as Twenty-second street. In arranging the loop wires running out to different subscribers, this company will meet with great difficulty, for the frequent changes of the instruments make underground connections inconvenient. During the month of May last that company changed the location of 550 instruments. They have decided, however, to use the alleys for planting bunches of these individual wires. In the center of each block at the intersection of the alleys they will run the wires of the subscribers in that block out upon a pole and distribute them. A little of this work has been done already, and more of it will follow on the South side this summer. The Baltimore and Ohio has comparatively few poles in the city, and they have been along Wabash avenue. A conduit has been put in north of Harrison street for these wires, and what few trunk lines they have are also underground.

"We have always had the best of the fight with the electric light people and the parties running tickers, for the reason that they have never had any franchise to use the streets, and I've made them do about as I please. As a result, Chicago hasn't a single electric light wire suspended across or through its streets—something that no other city in this country can boast of. For the accommodation of the electric light people and the private lines, the Sectional Conduit Company has done a great deal of underground work, and a good deal, too, under the sidewalks, and these folks have no poles in the city.

Since the law took effect, about 600 poles have come down, and, contrary to the old-time experience, there has been no larger pole put up in the place of any of these. Two hundred more poles will disappear soon. The amount of conduit occupied by each of the companies as it stands at date, has been roughly computed to be about as follows:

	Miles of Conduit.	Miles of Wire.
The city wires	1.75	60
Underground Co.	8.	150
Western Union Co.	10.	400
Chicago Telephone Co.	3.	700
United Lines Co.	19.50	500
B. & O. Co.	.50	50
Western Electric Co. (thermostat wires.)	1.70	8
Total	44.45	1868

The Chicago Telephone Company will double their underground plant before the season is over. The Professor claims:

"There has been no serious trouble in the operation of any of these lines, and I tell you it pleases me to find that, after fighting for years, these people are coming around to my views of it. Some of them have even gone far enough to say that they are glad their wires are under ground; but they will kick about the trouble and expense of putting them there.

"The whole scheme is easy enough, but it's slow, and I'm glad that we are getting to a point where the absence of the poles will make some showing.

"I think, upon the whole, we have done well in this town, considering the difficulties we had to contend with. We're going to keep on with the work as usual. As I said, the thousands of wires and poles in the streets immediately west of the river will be attacked next; but I think we will be doing well if we clear the entire city of overhead wires in ten years. I mean the city with its present limitations. If all the southern suburbs are taken in, no one can even guess when we will get through with the work."

The labor of following up and arresting every gang of trespassers became irksome to the Professor, and he some time since adopted an easier method of settling accounts. In a recent interview he said:

"I have ceased to arrest linemen for stringing wires, as they lie me out of my case. I keep men in each district, who are required to keep track of each new wire put up. Once in two months I go around and seize all new wires, which saves the trouble of going to the courts."

There is a tangled spot in the ways of the Town of Lake Electric Light Company. A bill was filed in the Circuit Court the other day by Wm. H. Christian, who wants a receiver appointed. Christian is a stockholder. It is claimed that J. W. Brennan, who held a controlling interest, sold out to Edw. R. Swett, who purchased the shares with funds of F. M. & B. T. Marten and W. S. Miller. These gentlemen are largely interested in the Lake Electric Company, which is an offshoot of the Lake Gas Company, and a rival of the former electric company. It is said that the parties, Miller and Marten set to work to wreck the Brennan Company, and voted to give judgment note of the company for $5,000, due in thirty days. The president declined to sign the note, and the bill was filed before the company was irrevocably committed. An injunction was issued restraining the company from going any farther in the matter.

Col. Lynch, broker at 146 La Salle street, gives the following as telephone stock valuations:

Chicago	$350 @	$360
Central Union	45 @	47
Michigan	63 @	65
Iowa Union	15 @	18
Great Southern	29 @	31
Great Southern, Script, 90 cents on the dollar.		
Colorado	18 @	20
Rocky Mountain Bell	40 @	45
Missouri and Kansas	54 @	56
Missouri and Kansas, Script, 55 cents on the dollar.		
United	15 @	17
Cumberland	65 @	70
Wisconsin	103 @	105
Bell of Missouri	147 @	150

CHICAGO, June 28, 1886.

BOSTON ELECTRICAL NEWS.

The field for arc-light plants has, in all cities of any size, been well occupied by local companies. There is a very general, but erroneous, impression that small towns could not with profit support an electric light station. Whatever truth there might once have been in this statement, the conditions are now much changed. By recent improvements, arc lamps, motors, incandescent lamps of different powers, can be run one circuit. The demand for incandescent lamps is fully equal to that for arc lights, and the field for small motors of ½ to 3 horse-power, is also very large. It would seem plain, then, that those villages which are much too small to economically supply arc lights can enter profitably into the business of furnishing arc, incandescent lights and power combined.

We have all heard of the pooh-bah jack-knife, with boot-brush, crowbar and clothes-wringer combination. While in the case of a motor of the same name, so-called, because, as regards speed, power, etc., it will do anything desired, a demand was made for a speed counter. One of the party present, after hunting high and low, said, "I have it," and produced a well-used corkscrew. It is needless to say that for fear of paralyzing the motor this revolution counter was not used.

Tests have recently been made at the office of the Brush Electric Company, of Boston, with a Sun distributor box, in conjunction with a Sprague automatic motor. It was found that on a 3,500 volt circuit there was practically no sparking at the brushes, though the power taken from the motor was varied. The motor was run in parallel with varying numbers of incandescent lamps, and without the slightest flickering, the distributor box making adjustment for all changes. The circuit to the motor was repeatedly broken by removing a bare wire from one binding post of the motor, with no shock and as little sparking as would be noticed if the same thing were done on a 100-volt multiple arc circuit. At the termination of the experiment an order was given for 50 distribution boxes. The Boston Brush Company have 190 miles of wires, the longest lines in New England covering the entire city and reaching into the suburbs. The demand for power, which heretofore could be supplied from a low-tension circuit, will now be met by motors on arc-light circuits. The increase of business due to power alone will probably require 30 per cent. more power than they are using at present. Motors will be run in Charleston, Cambridge, Brookline, South Boston.

It is often a subject of remark that large houses are built without all modern electrical improvements. A $500 dollar tapestry carpet appears more of a necessity to some match users than convenient devices that would do away with the use of matches; an occasional contribution to the equalizers of wealth who enter houses by night, than a system of burglar alarms. Architects can do more than perhaps any others to introduce these modern improvements, and it would seem desirable that the schools of architecture—and there are many in this country—give instruction in practical electricity. A well arranged system of thermostats and alarm bells would be a better protection for a house than the most improved fire department.

The amount appropriated for the street lighting of Hartford, Conn., for the ensuing year is $42,000, this being divided between the electric light and gas companies. A proposition has now been made by the electric light company to light the entire city with arcs and a few naptha lamps. The people of Hartford are strongly in favor of the change. A committee on the part of the Aldermen and Council has been appointed to arrange matters with a view of making a contract on the terms proposed.

In a competitive test of two incandescent machines it is not difficult to make the conditions the same for both. With arc machines the case is different; length of line wire, imperfect contacts contribute in as far as they are unknown to the non-reliability of the test. Another factor, and that too important, which is commonly overlooked, is the variation in resistance of the carbons used. This varies from ½ to 5 ohms. Suppose two 10-light circuits, resistance of each lamp 4 ohms.; the resistance of whole of first circuit 45 ohms, of second 90 ohms. The second circuit requires before the carbons are burned down twice as much power per light, or, stated differently, for the same horse-power only one-half, as lamps could be run on the second circuit as on the first.

A knot of workmen were discussing the size of carbons; one thought the size depended on fashion; another that they were of a certain size to carry the current, when C. Arbon, who had worked for Carry & Seemuns, gave his friends a few of his ideas as obtained by experience: "You can use different sizes of carbons, if they are small the whole pencil becomes hot for the whole length and wastes away too fast. If you put in big carbons the current, such as they use in these city lamps, would not heat the points hot enough to give much light. They would last longer, and that would be a good thing. You can see that there will be a size somewhere between the extremes that will be a size that will be just right, and they have found $\frac{7}{16}$ or ½ inch is about right."

The bill granting a charter to the Winthrop Electric Railroad Company has been signed by the Governor, and is now a law. In view of the great opposition to the numerous petitioners for electric railroads in Massachusetts it is indeed significant that an exception was made in the case of these petitioners for a road at Winthrop. The car on the experimental track has been run at the rate of 35 miles an hour up a grade of 360 feet to the mile. It is expected that 1 mile of the Winthrop road will be in operation by September 1. Cars are to be run from 6 A. M. till midnight, longer trips being made as fast as the track is completed. A large number of applications have been made by graduates from electrical schools for positions on the road. Those in charge of the motors are to be called motorneers. Real estate in Winthrop has taken a boom, rising 10 per cent. in last few weeks. The present company, the Enos Electric Elevated Railway Company, incorporated January 6, 1886, have just cause to be proud of success in the last six months, for in that time they shown, in good working order, a model in Boston, full-sized track and car at Greenville, N. J., and have obtained a charter. The stock of the company is selling at $100 a share, and a dividend in amount exceedingly gratifying to the stockholders will be declared at once. Mr. C. J. H. Woodbury, whose statements caused the adverse report in the case of the elevated electric railways of Boston, favored granting the charter in the Winthrop case.

BOSTON, July 5.

At the meeting of the Board of Managers of the Electric Club, July 1st, seventeen new members were admitted, and six applications were posted. It was decided that the courtesies of the club be extended to the present applicants during the time required by the by-laws for posting the names of new members. Mr. Cyrus O. Baker, Jr., of Newark, N. J., was added to the Board of Managers, completing the list required by the constitution. An elaborate dinner was discussed in the rooms of the club at the Hotel Dam, and then followed adjournment to 6 o'clock P. M., August 5th. The down-town lunch annex at French's Hotel, where two pleasant, cool parlors are set apart for the exclusive use of the club, is proving particularly popular, and notwithstanding that the location is somewhat inconvenient for a number of the members, the accommodations are so satisfactory, and lunching with so many electrical gentlemen has proved so interesting, that there is always a good and increasing attendance.

Telephonic News

*** Superintendent Hockett, of the Indianapolis Telephone Exchange, states that 445 telephone subscribers have already adopted the new system of becoming agents, and paying in accordance with the number of connections.

*** A certificate has been filed at Springfield, Ill., recording the change of the name of the Merchants' Mutual Telephone Company, at Chicago, to the Chicago Pan-Electric Telephone Company, and of the increase of the capital stock of the company from $10,000 to $1,000,000.

*** The Mutual Telephone Company, of Burlington, Iowa, has been organized, with Messrs. J. W. Burdette, E. A. Brenizer, William H. Morehouse and John M. Mercer as incorporators and directors. The telephone that these gentlemen expect to use is the Meucci.

*** Mr. Charles Dutton, of 195 Broadway, New York, auditor of the Southern Bell Telephone Company, and well known as an expert accountant, has recently prepared an "Analytical Book-keeping Chart," which is a complete exhibit in tabular form of the science of accounts. The system of keeping accounts is here reduced to simplicity, the chart showing the fundamental principles in the transactions of business to be divided into two general divisions, explained under the heads of the "Analysis of Business," and the "Analysis of Book-keeping." Every book-keeper and accountant, however expert, will be interested in this new work.

*** The Board of Police of the city of New York are considering the proposition to abolish the slow and old-fashioned telegraph system of the Department and to substitute a system of telephones. Commissioner Voorhis, who is chairman of the Committee on Repairs and Supplies, has given much of his time recently to a study of telegraph and telephone communication in the city. He read a long statement to the Commissioners attempting to show the advantages of the telephone over the dial telegraph now in use in the Department. His statement was based upon a proposition made by the Metropolitan Telephone and Telegraph Company to establish a telephone system for the Department. The present telegraph system costs the Department about $13,000 a year, including the salaries of a superintendent of telegraph, six operators at headquarters, one batteryman and a lineman. The department owns five circuits of telegraph wire, extending from one end of the city to the other. It is the proposition of the company to establish a telephone system, using the department wires, and to maintain the system for $12,500 a year. Employés of the company will take the places of the superintendent of telegraph and his assistants at headquarters, and for the present the department will not be put to any additional expense. At present there is no telegraph communication between police stations, except through the Central Office. The company offers to establish thirty-five circuits, to connect all the stations with headquarters direct. A switch-board at headquarters will enable police captains and sergeants to talk with one another without leaving their stations. It is also agreed to connect 350 street boxes containing telephones with the police stations. If the system works well, the company is willing to establish a telephone on each of the 971 patrol posts in the city, and to connect them with the stations, for $80,140. While the Commissioners were inclined to think the proposed system would be a great improvement on the present one, they laid the subject over for further consideration as it will be necessary to get the consent of the Board of Aldermen before they can make a contract with the telephone company.

*** The report of the New York Subway Commission, published in this issue, will be read with much interest by all electrical companies, particularly the telephone companies, which are the most vitally interested in the outcome of the underground question.

*** One of the most intelligent of gentlemen doing business in South America is Frank W. Jones, who is at the head of companies which are extending telephone lines in South America. He makes his headquarters in the East, at Buenos Ayres, and on the West Coast at Valparaiso. He recently arrived here from the latter city. Telephone exchanges have been introduced in nearly all the large cities on the West coast, and in several on the East. Talking about his trip northward, he said: "It took me 40 days to reach here from Valparaiso. I ought to have come in 20 days. There never, in the history of the world, have been such outrageous arrangements as at Panama. The British line steamers from the South reach Panama just one day later than the sailing date of the Pacific Mail lines from Colon northward. Passengers on our vessel were therefore kept in this place for a whole week waiting for the next Pacific Mail steamer. The managers of the two lines lay the blame one upon the other. It comes, I think, as much through the lack of proper encouragement of the shipping interest on the part of our Government as from any other cause. While a man can get through to Valparaiso in 40 days from New York, letters sometimes take two or three months, utterly destroying prompt business relations. There is no question but that an immense commerce could be built up with South America if we had proper communication, which can only be brought about by Government assistance in the encouragement of quick communication. It would be the most popular movement any Administration could set on foot."

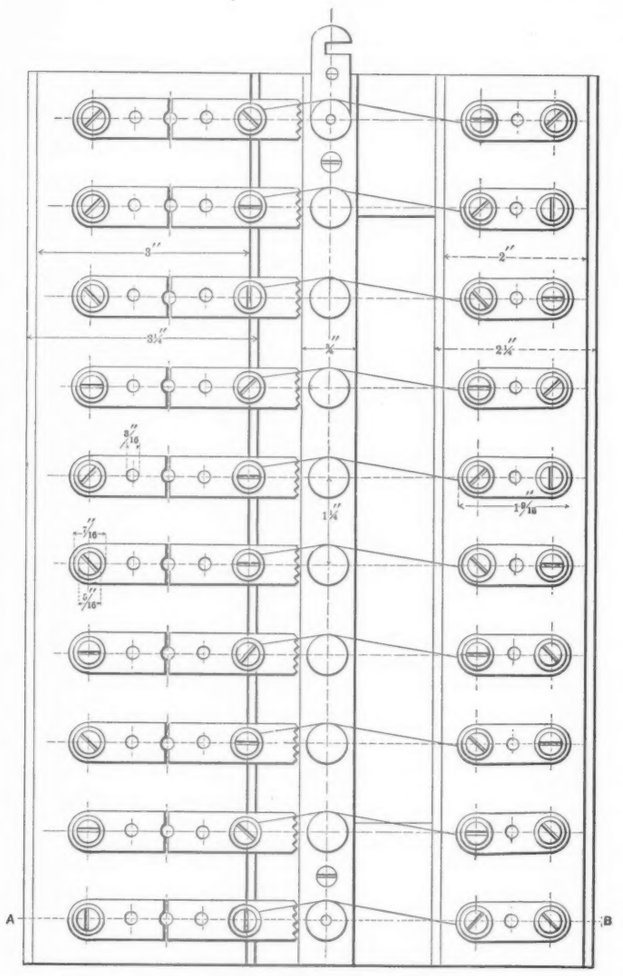


FIG 5.—GROUP OF TEN LIGHTNING ARRESTERS, AS ARRANGED IN THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY'S CABLE HOUSES.

Report on the Telephone Investigation.

The committee appointed by the House of Representatives to investigate the Pan-Electric telephone scandal affecting certain high Government officials has reported. Three reports were handed in. One was signed by the four Republicans of the committee, another by four of the five Democrats, and the third by the fifth Democrat of the committee, whose views of the matter are somewhat similar to those of his Republican colleagues. The Ranney (Rep.) report is a terrible indictment of all the prominent officials connected with the Pan Electric "conspiracy," brings out clearly Attorney-General Garland's connection with the conspirators, and Solicitor-General Goode's questionable action in ordering the Government suit without proper investigation. This report presents a complete history of a "suit brought ostensibly in the interests of the public, but in truth and in fact for the purpose only of advancing private ends," and claims the department is disgraced and the Government involved in an expense of $300,000, all for the benefit of a few impecunious gentlemen.

The general conclusions of this report are as follows:

"That there was no sufficient reason nor exigency for bringing the suits, because the patents had been invariably sustained, and each of the petitioners had an opportunity to prove in existing suits those charges which they told the Attorney-General they could prove in a new suit, and were strong enough and wealthy enough to do so, if the truth was as they stated.

"That the questions presented to the Executive Departments received no consideration adequate to justify these suits, for the department which considered the evidence formed no opinion, and the department which formed an opinion never considered the evidence.

"We then look at the history of the Pan-Electric Company—who formed it; how and why they entered it; how they used their names to make the public believe that they did not infringe the Bell patent, when they know they did; how the Senators and Congressmen in it tried by their own influence to get their telephones into the Senate and the House; how and why the combination to obtain the Government suit was formed, and how its real character was concealed and misrepresented; the extraordinary manner and speed with which all the usual safeguards were disregarded and the petitioners gratified.

"There is only one conclusion from all this: The Pan-Electric Company was pushing this matter with all its vigor for its own interest. The National Improved Company felt that for its interest in the matter of obtaining leave to bring this Government suit it must have the aid of the Pan Electric. All parties knew that the transaction was not one which would bear public inspection, and so they did their best, not to leave it undone, but to keep it unknown.

"This was a proceeding to obtain, in a matter of mere grace and discretion, the permission from the Department of Justice, to the head of which had been given $500,000 in stock in each of two companies without money payment, and solely in consideration of such services as he might render. The fact is, and he knew, and all the parties knew, that the permission was sought, and was to be used solely for the private benefit of his company and its ally, and not for the public good. They pushed for the permission, and they got it, and by putting forward a stalking horse to deceive the public they confessed that their real plans and methods would not bear the light of day.

"The suit brought in the name of the United States for the alleged purpose of getting the Bell patent vacated was the result and the achievement of a combination, not inappropriately called a conspiracy, formed by Casey Young, the secretary, treasurer and counsel of the Pan-Electric Telephone Company, and acting in its behalf (Senator Harris co-operating with him to some extent), and Watson Van Benthuysen, president, and acting for the National Improved Telephone Company, of New Orleans, La. They proceeded and operated to that end in disguise, and, holding out all the while false colors, assumed for the purpose of blinding and deceiving the general public only. The suit was sought and obtained ostensibly in the interests of the public, but in truth and in fact for the purpose only of advancing exclusively their own private ends. There is good reason to believe, and we feel constrained to find that, in our judgment, the proceedings would not have been asked or allowed, as they were, had it not been for the relations of the Pan-Electric Company with Government officials, and for the large interest therein especially held by the head of the Department of Justice.

"The plea is that the parties concerned did not think that they were doing wrong. But a Government which expects to be respected cannot permit such things to be done, such influences to be sought for, or such personal interests to exist and avail. It is not enough that those personally interested, who ought to have prevented it, to say that they did nothing and meant to know nothing.

"As to the past and probable future expenses attending the prosecution of the Government suit, the committee are unable to furnish any definite information. Should the pending suit be heard and tried on its merits, it must be attended with a large expenditure of money. Judging from what litigation is said to have cost in the other telephone suits, we should estimate the same as likely to be not less than $300,000."

The report of the Democratic four, the Boyle report, says that neither the Bell nor the Pan-Electric Company, nor their agents, have attempted to improperly influence officials through the press, and that "the committee does find that there was sufficient 'reason and authority' for bringing the suits, but it expressly refrains from attempt-

ing to find whether the Bell patent was obtained fraudently, or whether Bell was the inventor of the speaking telephone." This report is like the first one, very lengthy, and attempts to prove the entire innocence of wrong-doing on the part of all who were interested in the Pan-Electric Company. The report is accompanied by the following resolution:

Resolved, That a full, fair and exhaustive investigation has failed to adduce any evidence which tends to show that Attorney-General Garland, Solicitor-General Goode, Secretary Lamar, Indian Commissioner Atkins, Railroad Commissioner Johnston or Senator Harris, they being named in the Pan-Electric publications of the newspaper press, which gave rise to this investigation, did any act, official or otherwise, connected with the matter investigated, which was dishonest, dishonorable or censurable.

A Caustic Review of the Pan-Electric Scheme.

The New York *Sun*, under the head of "Ground for Impeachment," has the following:

"Four of the nine members of the committee appointed by the House of Representatives to investigate the Pan-Electric Telephone conspiracy, and to ascertain the true motives in which the Government suit to break the Bell patent had its origin, report facts and present evidence affording sufficient ground for the impeachment of the Attorney-General of the United States. We print elsewhere their statement and verdict. Another member of the committee, Mr. Hale, a Democrat, has prepared an independent report which is said to be substantially in accord with the conclusions here presented. That leaves in a minority those members of the investigating committee who, for political reasons, have agreed to whitewash the Attorney General and to declare that the Department of Justice has not been used for private ends.

"What a story of greed, dishonor, and shame! Not since the time when the evil horde that surrounded Gen. Grant at Washington were turning to dishonest profit the opportunities of public office, has there been so scandalous a perversion and prostitution of executive power in any of the departments. Not even the worst days of Republican corruption developed any single scandal of greater magnitude. The proof of bargain and sale is clear. With studied moderation of language, without a word of invective or a sentence of argument, by a logical marshalling of the established facts, presented in their relations with the lucidity and conciseness of a judicial charge, this masterly report proceeds step by step to the unwritten conclusion which no candid person that reads it can escape.

"The United States Constitution provides that the power of impeachment rests solely with the House of Representatives. This power was intended by the framers of the Constitution to extend not only to indictable crimes, such as treason, theft, and distinctly proved bribery, but also to just such offences against the public morals and just such gross infractions of the principles of honest government as that which the committee's report fastens upon Mr. Garland and his Pan-Electric associates holding office under the present Administration.

"If the Attorney-General implicated in this scandal were a Republican Attorney-General, and if it were a Republican President who refused or neglected to remove him from office, who doubts that the Democratic House would proceed promptly to bring him to trial before the Senate? Is the case changed because Mr. Garland and Mr. Goode and Mr. Atkins and Gen. Johnston and Senator Harris call themselves Democrats? We draw no such line in the enforcement of the laws of public morality. The *Sun* takes up this matter in the interest of good government and the honest administration of public trusts, and for exactly the same reasons as moved it in the case against the Credit Mobilier statesmen. Then the majority of men implicated were Republicans, but there were not wanting honest Republicans on the investigating committee to denounce the bribe takers and to use plain language about their crime. Now the persons indicted are all Democrats—all Southern Democrats. Is the duty of the Democratic House any less urgent, any less plain, because that is so?

"The best pledge the Democrats in Congress could give the country of the sincerity of their professions during fifteen years of Republican misrule would be to make Pan-Electric statesmanship forever odious, within the party as well as without. Short-sighted indeed is the course which a narrow partisan policy suggests under such circumstances as these. The attempt to cover up, to conceal, to whitewash, to exonerate, will be a confession that the party is not worthy to exercise the power with which the people have intrusted it. It will be confession, and confession is suicide."

.... Dr. Norvin Green, president of the Western Union Telegraph Company, said that the Western Union people could afford to wait until they came to a bridge before they attempted to cross it, and that the time had not yet arrived for them to show what they could do if the Subway Commission undertook to force them to cross it. If the Western Union Company, he said, had been allowed to proceed with its work of placing wires under ground, all its wires would now be hidden from view; but the company was retarded in its work by the creation of the commission. It had a system of its own, and had three tubes, each capable of holding 300 wires, constructed under ground as far as Twenty-third street, and the work would have been now completed as far as Forty-second street but for the intervention of the commission. The company was perfectly capable of taking care of its own wires, but the Legislature which passed the law concerning the placing of wires under ground evidently thought differently, and proposed that a construction company should make a vast sum of money by caring for the wires. Dr. Green paid a high tribute to Commissioner Flower's honesty of purpose in the matter, and said that that gentleman had shown remarkable ability in handling it. He thought that the removal of the poles from the streets and the wires from the roofs of buildings was merely a matter of sentiment. He did not wish it to be understood that he was opposed to placing the wires under ground. On the contrary, he favored the idea but he thought that his company, capable as it was of protecting its own property, should be allowed to build ditches for its own wires.

Poles and Wires.

There has been a new plan devised for handling the wires that originated in the islands of the Pacific. At Sidney, New South Wales, they are taking down all the poles, enclosing the wires in a case resembling a frieze, placing this close to the buildings, and so covering the wires and giving the cornice of the house a more elaborate appearance. The wire no longer hinders the fire department in their work, nor does the breaking imperil the lives of passers in the streets. The blockage of the poles is removed, while the wires running along the cornice are more accessible than strung in the air upon the roof or on the posts. The details of this innovation are as follows: The frieze will be supported by pillars sunk in the ground four feet six inches, and twenty-four feet six inches in height. Connecting these pillars are cast-iron beams eighteen inches wide, called friezes, and behind them are to be placed eight racks for holding cables, which are clusters of fifty wires embedded in an insulating substance, and coated with cement. They make a cable of one inch in diameter. It is estimated that the rack will hold 400 wires easily. On reaching the street crossings the racks will be made to descend to the level of the road, and will be carried underground to the other side, where they will rise to the previous level. The racks are in sections, so that the wires can be readily reached if connection or repair is desired. The property owner gets a small rent for this utilization of his building, and is held secure for any damage the work may at any time originate.

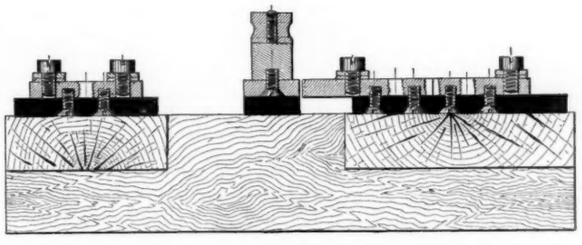


FIG. 6.—END VIEW OF SECTION A TO B. OF FIG. 5.

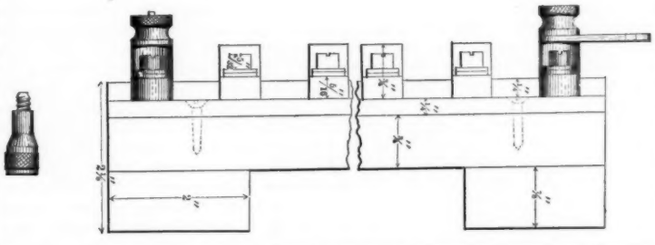


FIG. 7.—END ELEVATION OF LIGHTNING ARRESTERS, SHOWING CONNECTING SCREW.

.... There are about 6,000 subscribers to the telephone system of this city—which makes it the largest telephone exchange in any city in the world.

.... As a REVIEW reporter was passing along the streets of Boston the other day, meditating on the "w(h)attness" of the ohm and the statics of luminiferous electrically ruptured and consequently incandescent, imponderable ether, he was startled by the hop, skip and jump of a boy in the costume of a deliverer of messages. No less were the crowd on the street affected by the activity of the boy. They gazed with wonder at the frisky son of the ticker. The boy when asked for what company he worked, said he was employed by Drowsers and Best, No. 20,000 Park street, a full line of suitings, etc., and the boy made a ten feet leap toward the post office, while a real telegraph boy was drifting along on the other side of the street, sampling the new crop of peanuts.

TELEGRAPHIC

.... An exhibition plant of the Gamewell police telegraph has been put in Jersey City, and will probably be adopted by that city.

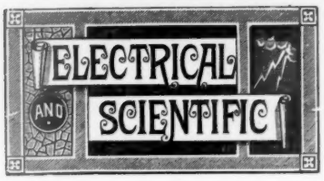
.... A Quincy (Ill.) man who was journeying farther West telegraphed home to his wifethat he had sent her a fine calf, and told her to have their son look after it on its arrival. Soon after the message was delivered the boy appeared at the telegraph office with a long rope in his hand, and asked the operators to deliver the calf to him.

.... At the annual meeting of the Reading and Pottsville Telegraph Company was held at Reading last week and the following gentlemen elected: President, F. B. Gowen, of Philadelphia; Directors, I. V. Williamson, John Wanamaker, A. J. Autello, and P. C. Hollis, of Philadelphia; Secretary, Howard Hancock, of Philadelphia; Treasurer, John Welsh, of Philadelphia.

.... The Northwestern Telegraph Company has opened its wires to the members of the Chamber of Commerce, of Minneapolis. There was a good deal of quiet congratulation of the officials of the Chamber, who felt that relief from the exactions and poor service of the Western Union was at hand. To Mr. A. J. Peacock fell the honor of sending the first message to Duluth, while the first received from that city was sent by A. J. Sawyer to Messrs. E. Holmes & Co., of Minneapolis. The line worked exceedingly well, and a very fair business was done during the first session. The average time for sending a message and receiving a reply was about 12 minutes. Heretofore from 35 minutes to two hours have been consumed. The company expect to open their Chicago line for business August 10, or, perhaps, by the 1st. There is a reduction of 20 per cent. in prices over Western Union rates.

.... The Boston police force have a good joke on a new member. It appears that the late addition to "the finest" was furnished with a fire-alarm key, and never having seen the inside of one of these boxes thought he would enlighten himself as to the mysterious inwards of these by means of his key. He got the box open all right, and looked at the works till he was satisfied, but when he had closed the box again he was horrified to find that he could not extract the key. A brother officer coming along kindly informed the victim that it would be as much as his life was worth to go away and leave the key in the box, as some fellow might come along and turn on a false alarm. So the new man "lingered near," like Mary's little lamb, after the teacher had put it out, till the superintendent could be found. The policeman need not feel sore over the matter, for there is a young man in town who rushed to a box to turn in an alarm, but who, when he had opened the box, did nothing but stand and shout fire into it as if it were a telephone.

.... There is said to be considerable talk among the Western Union telegraph operators at Washington, D. C., of a probable strike before the close of the summer. Most of those who were spoken to on the subject maintained a studied reticence, but one of the number is reported as making the following statement: "Yes, it is true we are considering the advisability of a strike. We have certain demands that we propose to submit to the company. If the demands are not complied with we shall probably quit work on the 1st of August. It is not to secure an increase of pay, but rather to prevent the company from reducing our salaries, as has been the custom for several years past. I can better illustrate my idea by taking the case of a $90-man whom the company has seen fit to discharge. This man's place will be filled by a $60-man, which makes a practical reduction in the case of $30 a month. In the event of the discharged operator being reinstated by that company he will be fortunate to get back at $65, or at the most at $ 0 a month.



* * A new invention consists of a luminous paper, which is insoluable in water. It is made by mixing with the paper pulp, while in the process of manufacture, a powder composed of the sulphurets of calcium, bayrum and stroncium. The paper is useful for many purposes.

* * Schmidt & Kaelber, agents for the Western Electric Company, of N. Y. at Rochester, N. Y., are about to open a branch house at 226 Pearl street, Buffalo, under the name of the Buffalo Electrical Depot. All supplies manufactured by the Western Electric Company will be kept in full assortment. The firm is a progressive one, and their new move should prove an excellent one.

* * A novel electric bell is described, in which the battery is contained in a cylinder of brass, inside which the line wire can be coiled by turning a little winch handle, and the gong is carried at one end of the brass case, serving as a cover for the magnet, etc. The case is provided with legs, so that the arrangement can be placed in a horizontal position; and there is also a ring, which enables it to be suspended wherever it may be desired. The outside dimensions of the whole apparatus are 6x4 inches.

* * "Why cannot we," said a long-headed citizen, "have a subterranean hotel at Niagara, underneath the American Falls, with a piazza looking out upon the vast sheet of falling water? All that is necessary is to sink a shaft on Goat Island, tunnel straight out under the channel, blast out a cavern, put in iron pillars if necessary to support the ceiling, and construct any sort of observation platform you please facing the fall from the rear. What more delicious place can you imagine in which to pass a sultry summer afternoon? A portion of the veranda might be shut off from the spray by means of plate-glass doors, so no change of clothing would be necessary for those who dislike dampness."—*Buffalo Courier.*

* * For the purpose of lessening the liability of accidents in the running of cable cars the Philadelphia Traction Company is introducing a new electrical system on the Market street branch. Leaden tubes containing telegraph wires are being laid along the conduits, and an alarm-box of simple construction will be placed in each manhole along the route of the cable cars to afford instant communication with the engine-house at Twentieth street. By this means, when an accident happens to the cable necessitating an immediate stoppage of the engine, an alarm can be sent at once to the Twentieth street station, and through an arrangement of signals any information that is needed to meet the emergency can be instantly forwarded.

* * A huge aerolite is said to have fallen into a pond near St. Regis Falls, this State, and nearly filled it. The body of water usually contained in the pond was nearly all spattered out, and the supposed smoke seen was steam, generating by the water running back around the heated mass. Mud was thrown into the tree tops, and trout were scattered promiscuously around the pond, literally covering the banks. The news soon became circulated through the neighborhood, and scores of boys and men were seen all the day following engaged in picking the fish up, and bushels of them were drawn away. The fish nearest the pond that flopped back into still boiling water were completely cooked. This huge mass seems to be mineral, but has not cooled off enough yet to admit of examination.

* * The following story comes from a school in the Midlands, England. The master told the boys of the third class to write an essay on Columbus. The following was sent up by an ambitious essayist; "Columbus was a man who could make an egg stand on end without breaking it. The King of Spain said to Columbus: 'Can you discover America?' 'Yes,' said Columbus, 'if you will give me a ship.' So he had a ship and sailed over the sea in the direction where he thought America ought to be found. The sailors quarrelled, and after many days the pilot came to him and said: 'Columbus, I see land.' 'Then that is America,' said Columbus. When the ship got near, the land was full of black men. Columbus said: 'Is this America?' 'Yes, it is,' said they. Then he said: 'I suppose you are the niggers?' 'Yes,' they said, 'we are.' The chief said: 'I suppose you are Columbus?' 'You are right,' said he. Then the chief turned to his men and said: 'There is no help for it, we are discovered at last.'"

Testing Dynamo Machines.

It is very easy to determine the electrical efficiency of a dynamo. We have only to ascertain what is the electrical energy given out and what is the electrical energy developed in the armature and to take the ratio between the two. All this is extremely easy, and requires no other apparatus than a Wheatstone bridge to measure the resistance of the different parts of the dynamo, and the usual current and potential indicators. The resistance once ascertained, the other measurements can be taken without in any way interfering with the working of the dynamo; and it is therefore but natural that the makers of these machines often make use of the term "electrical efficiency." But to the practical engineer the term has no meaning. He wants to know how much power he must provide to produce a given electrical output, inclusive of all losses, and he can only ascertain the power beforehand if he knows the actual commercial efficiency of the dynamo he is going to employ. The usual way of measuring the commercial efficiency of a dynamo machine is by employing some kind of transmission dynamometer, placed between the prime mover and the dynamo, and taking simultaneous readings of the energy transmitted and the electrical energy obtained. Now, every engineer knows that measurements of that kind are difficult to make, and require costly apparatus, especially if the power to be transmitted is considerable. Only the very best and most expensive forms of transmission dynameter—such as Tatham's or Brackett's—give fairly accurate results, and a cheaper class of instrument would be perfectly useless, as its own error would probably exceed the difference between electrical and commercial efficiency which we wish to ascertain. It must be remembered that the commercial efficiency of the modern dynamo is far greater than that of any other machine intended to convert energy from one form into another, and that the difference between an excellent dynamo and a fairly good one is reckoned by but a few per cent. in the efficiency. Hence a transmission dynamometer which may have an error of a few per cent. would be useless for our purpose, besides being, on account of its price, beyond the reach of most private individuals.

The difficulties which stood in the way of accurately determining the commercial efficiency of dynamo machines have recently been overcome in a most ingenious manner by a method devised by Dr. John Hopkinson. This method was first described by its inventor in the discussion following the paper on "Modern Continuous Current Dynamo Machines and their Engines," read by the author in November last at the Institution of Civil Engineers. It consists, broadly speaking, in measuring not the whole of the power supplied to a dynamo, but the power wasted by two similar machines, which are mechanically and electrically coupled, the one acting as a generator and the other as a motor. Dr. Hopkinson said: "Supposing 100 to be applied mechanically to the first machine, a power of 90 might be delivered by that machine to the second machine. Of that 90, 80 would in the second machine be converted into mechanical power, which mechanical power would be transmitted by the shaft to drive the first machine. There would remain then to be supplied only 20 for driving the whole combination. The quantities to be measured are then 20 and 90. Suppose that instead of measuring quite accurately the measurements were 91 and 19.8. That 19.8 waste is divided between two—9.9 for each. Consequently the first machine, apparently with an expenditure of 100.9, gives 91, so that although errors were made of 1 per cent. in each determination, in the final result of efficiency there is only an error of 0.2 per cent."

Durability of Zinc When Exposed to the Atmosphere.

Dr. John Percy, who is a very high authority, in his book on Metallurgy, published by John Murray, of London, in 1861, writes as follows:

"At the ordinary temperature, zinc is not acted upon by dry oxygen; but when exposed to moist oxygen or to atmospheric air, its surface acquires a compact, tenacious, gray coating of hydrated oxide, which impedes the oxidation of the subjacent metal. In this respect the rust of zinc differs much from the rust of iron, which, instead of impeding, seems rather to accelerate the oxidation of the subjacent metal. By the conjoint action of moist oxygen and carbonic acid, zinc is converted into a hydrated carbonate. The roofing from which the specimen analyzed was obtained had been exposed to the atmosphere of Munich for 27 years. Pettenkofer ascertained that during that period 8.381 grammes of zinc per square foot (Bavarian) had been oxidized, and that nearly half of the oxide is carried off by rain. Hence he estimated that a layer of zinc only 0.005 of a line (a line is one-twelfth of an inch) in thickness requires, in the atmosphere of Munich, 27 years to be entirely corroded; so that, leaving out of consideration the oxidation of the lower surface, which may be practically disregarded, a zinc roof of one-quarter of a line (equal to one forty-eighth of an inch) in thickness would be completely corroded in 1,243 years."

Timing Bicycle Races by Electricity.

E. H. Foote, of the Massachusetts Bicycle Club, has submitted to President Ducker a scheme for obtaining absolutely correct timing of races, and it is so ingenious that the club will put it into practice. The details are: Take a strip of rubber, 2½ to 3 inches wide and $\frac{1}{16}$ inch thick, long enough to cross the track. Sew or rivet on one side of this two strips of thin sheet brass or copper. Fold the two sides of the strips together. Fasten one end to the ground on the opposite side of the track to the judges stand, the other end to the ground on the side next the stand. This end to be attached to a block of wood or rubber, having binding screws connected with the metal strips. These screws are also connected in circuit with a battery, and a loud, single-stroke bell. The strips are kept apart at the opposite end by a wooden plug if necessary. The riders to be started with their wheels just in contact with the strips. Whenever there is pressure enough put on the rubber to place the metal strips in contact, the bell will sound. The starting time to be taken at the first stroke of the bell, when the first man crosses, as there would be a slight variation in the men getting away, and the rear wheels would also cause a stroke. The time of finish to be also taken by stroke of the bell. The time between the strokes of the bell would be absolutely correct, and could probably be taken more accurately than by the eye. This system could be extended by putting in the battery circuit a recording instrument which would automatically and accurately record on paper each and every time, however many men there might be in the race. This would necessitate quite an additional expense, as the recorder would have to be actuated by an accurate time-piece.

* * Georgetown, Colorado, is negotiating with the United States Electric Company, of Denver, for the placing of an electric light plant to be used in lighting the city.

Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENTS OBTAINED THEREON.

1861.

No. 31,545. Feb. 26, 1861.
Charles Kirchoff, New York.

This is the first American patent, and is practically a resume of all that was known regarding the storage of electricity up to the date of the patent. Cells are described in which the electrodes are of copper, or copper and zinc (alone or amalgamated), immersed in a solution of sulphuric acid, or a solution of the sulphate, nitrate or amidide of copper or zinc

Others in which the electrodes are of platinum in a solution of nitrate and acetate of lead, nitrate of potash, acetic acid and nitrate or acetate of iron or zinc. Others in which the electrodes are of lead in an electrolyte of sulphuric acid and water. The patent further describes an apparatus for commutating the currents from a number of batteries.

1866.

No. 53,668. April 3, 1866.
George G. Percival, Brooklyn, N. Y.

Relates to a battery having electrodes of granulated carbon or lead in a solution of sulphuric acid and water. The electrodes are separated by a porous partition.

1879.

220,507. Oct. 14, 1879. Filed Feb. 25, 1879.
English Pat. No. 4,400. Oct. 29, 1879.
Elihu Thomson and Edwin J. Houston, Philadelphia, Pa.

Consist of a glass cell containing two electrodes of copper, arranged horizontally in a solution of zinc sulphate.

The upper electrode, or both, may be of iron, lead, or hard carbon, in place of copper.

1881.

247,934. Oct. 4, 1881, Filed July 6, 1881.
James A. Maloney, Washington.

Consists of a glass vessel containing a porous cup, in which is a coil of sheet lead coated with red lead, and between the cup and containing vessel is a second coil of lead also coated with red lead. The electrolyte is the ordinary solution of sulphuric acid and water. The claim is for the process of forming in acidulated water and then immersing in clean water.

247,935. Oct. 4, 1881. Filed July 20, 1881.
James A. Maloney and Franz Burger, Washington, D. C.
Device same as No. 247,934.

248,769. Oct. 25, 1881. Filed Aug. 22, 1881.
James A. Maloney, Washington, D. C.

Device similar to patent No. 247,934, with the exception that the roll of sheet lead intended as the negative electrode is coated with peroxide of lead, and that intended to be the positive with a layer of the sulphate of lead.

1882.

252,002. Jan. 3, 1882. Filed April 20, 1881.
English pat. No. 129. Jan. 11, 1881.
French pat. No. 141,057. Feb. 9, 1881.
Camille A. Faure, Paris, France.

The electrodes consist of leaden plates on which is mechanically applied a press composed of a divided metal, a metallic oxide or salt, or a mixture composed of any of these materials with an inert material such as coke. The paste or porous material is retained in position by means of a covering of felt, or other similar cloth, or a netting of cane, gutta-percha, etc., etc.

256,070. April 4, 1882. Filed Jan. 18, 1882.
English pat. No. 5,494, Dec. 15, 1881.
Joseph Wilson Swan, Newcastle, England.

Relates to method of preparing leaden plates for electrodes, consisting in subjecting them to the combined action of acetic acid and atmospheric air and subsequently reducing the carbonate of lead so formed to metallic lead by making such plates the

positive electrodes of a battery, the nacent hydrogen evolved being the reducing agent.

259,657. June 13, 1 82. Filed Apr. 3, 1882.
English pat. No. 3,926. Sept. 10, 1881.
" " " 3,987. " 15, "
John S. Sellon, London, England.

Relates to electrodes provided with re cesses or receptacles formed in or on the body of the plates in which the active material or matarial to become active—such as "metal, m etllic salts, oxides or compounds" is packed. The recesses or receptacles may be formed through the body of the plates or in the body of the plates by inde ting, serrating their surfaces, or by constructing the plates with corrugations, grooves or other suitable section, presenting an extended surface, or they are formed between plates (two to each electrode) which may be plain or grooved, serrated or indented.

Plates may be of rolled or cast lead—or alloys of lead, lead strips or tubes may be used supported in suitable metallic or wooden frames. The object of the various forms being to attain a large amount of surface of the material active in the battery in such a position and under such conditions as to be readily subject to the influences of charging and discharging as required.

260,653. July 4, 1882. Filed June 15, 1882.
Charles F. Brush, Cleveland, Ohio.

Relates to electrodes of etagere-like form containing in the spaces between its shelves lead in a finely divided state.

260,654. July 4, 1882. Filed June 15, 1882.
Charles F. Brush, Cleveland, Ohio.

Claim for process of forming plates. Consisting of forming receptacles for oxide of lead in their surface, then applying oxide of lead to the plate within such receptacles, and afterwards subjecting the oxide of lead to pressure.

261,435. July 18, 1882. Filed May 1, 1882
English pat. No. 2,135. May 6, 1882.
Charles Cuttriss, Leeds, England.

Relates to forming battery plates of bundles of thin lead turnings, lead wire or gauze, or of thin strips or scraps of lead, lightly pressed together and united at one end to a solid strip of metal, as a conductor.

Claim for process of coating electrodes, consisting of immersing the same in an oxidizing solution of sulphuric acid, bichromate of potash, nitric acid and water. The water may be omitted.

261,512. July 18, 1882. Filed June 9, 1881.
Charles F. Brush, Cleveland, Ohio.

Relates to and claims a process of coating electrodes with a porous layer, consisting in coating the plates with a compound of lead (lead oxide), and then reducing to a metallic state by means of an atmosphere or current of carbonic oxide, or hydrogen, at a temperature below that required to fuse the reduced lead.

261,995. Aug. 1, 1882. Filed June 9, 1881.
Charles F. Brush, Cleveland, Ohio.

The construction is such that the plates or elements of the battery form the principal walls of the cells or vessels containing the electrolytic liquid, so that one side of an element may form the positive element of one cell, and the other side the negative element of the next cell, where a number of cells are arranged together.

It also relates to embedding the edges of the element in a suitable cement, to retain them in their respective positions in the cell.

262,533. Aug. 8, 1882. Filed May 27, 1882.
Charles F. Brush, Cleveland, Ohio.

The claim is for the process of making storage battery elements, consisting in covering one or more or all the surfaces of a metallic or electro-conducting core, either with superficially oxidized particles of lead and lead oxide, and afterward applying pressure sufficient to wield the particles into a compact and firmly coherent mass and the mass to the core.

Italian, XXVI 409. Sept. 30, 1881.
Spain, 2,090. Dec. 20, 1881.

The electrodes consist of a number of thin sheets of lead plain or corrugated, first treated with sulphuric acid to produce a layer of sulphate of lead and then bound together. Or they may be made up of a number of plain or corrugated strips of lead bound together or braided. The elements are wrapped in parchment. The battery is formed according to the Plante reversible process.

263,124. Sept. 5, 1882. Filed June 13, 1882.
Chas. F. Brush, Cleveland, Ohio.

The elements are of any shape such as strips, plates or wires, and are formed primarily of an alloy of lead and any non-oxidizable metal or substance. The amount of lead in the alloy so limited in quantity that the oxidizing action in forming the element shall be confined to the surface of the alloy (element).

264,211. Sept. 12, 1882. Filed June 28, 1882.
Chas. F. Brush, Cleveland, Ohio.

The claims are for the process of forming two or more negative electrodes at the same time, and consist in placing in a single bath two or more plates all connected to the "oxygen pole" of the charging device, whereby all the plates are coated with a layer of per-oxide of lead. Then associating the plates as pairs in separate walls, and continuing the charge in the same direction, whereby the per-oxide on the positive plates is reduced to a spongy condition by the nacent hydrogen evolved. This patent is marked as case A, division A.

264,952. Sept. 26, 1882. Filed April 15, 1882.
Hiram S. Maxim, London, Eng.

Relates to a device for charging or forming the plates of storage batteries. The device is arranged in circuit with the generator and batteries, and is adapted to commutate the currents to or from the several batteries.

The claims are for the improvement in the art of forming plates, which consist in causing successively parts of series of cells that are charged in the same direction is in conjunction with the current from an external source for the purpose of forming the others without waste of energy.

(To be continued.)

—— The Mellville-Schuyler Electric Light Company, of Mellville, N. J., has been organized. The company will install a 90-arc plant there shortly in connection with series incandescents, having acquired a five years' exclusive franchise for that city.

—— The first city in Europe where electricity has been entirely substituted for gas for street lighting is the town of Hernosand, in Sweden, where the Thomson-Houston system has just been adopted. The motive power is water, which is very plentiful there, rendering the light cheaper than gas.

—— The Crystal Carbon Company, of Cleveland, Ohio, announce that they have just completed extensive works in that city for the manufacturing of electric light carbons and carbon plates. They have put in modern machinery and appliances, and are confident of satisfying the consumer with the quality of their carbons.

—— The colored fountain at the St. George (Staten Island) pleasure grounds is lighted by electricity, and is a very effective spectacle. On the opening night, a large number of visitors were present to admire the fountain. Its hundreds of jets permitted the almost infinite varying of the forms and combinations of its streams, through which shot broad beams of colored lights from beneath. The color changed constantly. At one moment it was crystal, the next roseate, then successively green, blue, purple, gold, and from time to time the tints would blend, harmonize, and contrast with new charms at every change. It had all the splendid brilliancy of fireworks, with a softer beauty and grace peculiar to itself, and the vast concourse of spectators applauded with enthusiasm while its display continued. Far out in the bay it could be seen, looking like a gigantic opal, illuminated by its internal fires. The electric lights of the fountain were sixteen in number, of 8,000-candle power each, and twenty-five men, were required to work the colored mediums and the jets. This fountain is said to be nearly double the size of any other illuminated fountain in the world, and truly seems one of the glories of fairyland, and electricity is the factor that makes it a success.

Served Them Right—Ought to Send to America and Get Electric Apparatus.

PARIS, June 29.—Thirty thousand people went last night to witness the performances in the immense Bull Circus at Nimes, in the department of Gard. The entertainment had been extensively advertised to be given under electric lights. The lights went out soon after the performance began and, owing to the defective apparatus, could not be relit.

The people became enraged and begun rioting. They tore down the fittings of the circus and made a bonfire in the arena of them and the furniture. Troops had to be called to restore order, which they only succeeded in doing after a desperate conflict with the people, many of whom were wounded and arrested.

—— The Wilmington Electric Light Co., has been incorporated at Wilmington, N. C., by C. E. McNett, E. E. Burriss, J. W. Atkinson, E. P. Bailey, H. A. Burr and others. The capital stock is $40,000. The company are erecting an extensive plant.

—— There is a shop a few doors from the Inns of Court Hotel lighted by arc lamps. A man went to look into the window of the shop and was suddenly knocked down by some unseen agent; a policeman thereupon went to complain to the manager inside, but he was knocked over likewise. The reason of all the mischief was that the whole of the framing of the shop was of metal, also the area frame in front, and one of the arc lamp leads had somehow become connected with the framing.

—— The American Electric Manufacturing Company held its annual meeting June 29. The following were chosen officers for the ensuing year: President and General Manager, Edwards H. Goff; Vice-President, L. M. Bates; Secretary and Treasurer, Henry E. Irvine; Manager Incandescent Department, W. J. Jenks; Trustees, Hon. H. Hyde, of Springfield, Mass., H. P. Frost, of New Haven, Col. Silas Gurney, of Boston, Chas. B. Whiting, of Worcester, Hon. L. M. Bates, A. B. Chandler, Rowland N. Hazard, Henry F. Gillig, Hon. John J. Kiernan, Henry C. Adams, Edwards H. Goff and W. J. Jenks, of New York; Executive Committee, L. M. Bates, H. E. Irvine, R. N. Hazard, E. H. Goff, H. C. Adams. The company's books show over one thousand lamps and accompanying dynamos now ordered and in process of construction, and the outlook indicates the activity which exists in the search for good apparatus.

—— A comparative evaporative boiler test was made at Jackson, Mich., at the Edison Station, between a Zell Safety Boiler and two Return Tubulars, each having been fired and tested on separate nights by Franklin Van Minkle, M. E., of New York. The coal used was from the Jackson mine, and of very inferior quality. The Zell Boiler, it is stated, showed a saving of 28 per cent. in fuel over the Return Tubulars, and 5 per cent. of superheat in steam, while the Return Tubular shows 9⅜ per cent. primage. The active saving of Zell Boiler on basis of dry steam (no allowance for superheat) was 39 per cent. The manufacturers of the Zell Boilers make the claim that it is the only steam generator yet placed on the market that will work beyond its rated capacity, with economy, giving absolutely dry steam, and they sell them on this guarantee. The Dickson Manufacturing Company have fitted up their Wilkesbarre shops specially for the manufacture of the Zell Boiler, and are executing orders for a large number of these boilers, among which is a 300 horse-power for Wallace & Sons, Ansonia, Conn., and a 1,200 horse-power for the Edison Company, of Detroit, Mich. Mr. Robert R. Zell, M. E., inventor of this boiler, has been recently appointed eastern agent of the Dickson Manufacturing Company, with offices and warerooms at No. 112 Liberty street, New York City, and intends to make a specialty of introducing these boilers in the electric light field.

ELECTRIC LIGHT NEWS

—— At the beginning of the present year the number of electric street lights belonging to the city of Brooklyn was 320. Since then probably 250 have been erected, and the demand for them continues without cessation.

——North Attleboro (Mass.) Steam and Electric Co. has just received a contract from the town authorities for 45 arc lights for street lighting, and have purchased the plant from the Schuyler Electric Light Co.

—— Messrs. T. P. Bailey and J. H. Reid are together in the electric lighting business, with headquarters in Chicago. They will make a strong team for securing the Western business for the Thomson-Houston Electric Light Company. These gentlemen are enterprising and well known in the electric lighting field.

——M. Lodyguine, a French electrician, has lately produced an incandescent lamp which is said to have a long life-time, and which requires but 1.6 watt per candle-power. Thus for a 20 candle-power lamp the E. M. F. required is only 40 vol s and .84 amperes, or twenty lamps of 20 candles per horse-power—a degree of economy not heretofore realized.

—— Nashua, N. H., is soon to be lighted by electricity. The Nashua Gas Light Company contracted with the Nashua Company's mills and the Jackson Company to light a portion of their mills with the incandescent light. The company will also be ready to light stores with the incandescent and arc systems. It is very probable also that the city will adopt some of these lights in connection with its gas lights for lighting its public places and in the compact business portion of Main street.

—— The Delaware Electric Light and Power Company, of Wilmington, has been incorporated. The stockholders of the new company are Wilmington men. The object of the company is to put in electric plants at any isolated points where they may be desired, more particularly for the purpose of supplying light, although the right is also given to generate heat for buildings, and power with which to raise and carry water. The company has already a contract for putting in an electric plant at Middletown, and it is expected that the town will be lighted by electricity by the middle of August. This company is prepared to put in plants of a similar nature wherever desired.

—— At the June term of the Orange County Circuit Court of this State, Judge Cullen presiding, a decision was reached last week in the case of Margaret Bohen against the Port Jervis Gas Light Company that is likely to be attended with far-reaching consequences. The plaintiff, whose residence adjoins the company's works, brought suit to recover damages for alleged injuries to health and comfort and depreciation in the value of real estate, caused by the noxious fumes exhaled in the process of manufacturing gas from naptha or petroleum, which gas, it is claimed, is combined with that from coal for producing a cheaper product for illuminating purposes. On the testimony presented, and under the instructions of the court, the jury gave the plaintiff a verdict for $340 damages. Whereupon, on motion of plaintiff's attorney, the court granting an injunction restraining the company from continuing the manufacture of naptha gas. As this gas is extensively used in its primitive form, or in combination with coal gas, in lighting towns and villages and factories and private residences throughout the country, a judicial decision, the effect of which will be in many cases to prohibit or seriously interfere with its manufacture, is a matter of grave consequence to all concerned. The Port Jervis Gas Company will carry the case on appeal to the higher courts.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 29, 1886.

344,343 Electric incandescent lamp; Charles E. Buell, New Haven Conn.
344,344 Electric illumination; Charles E. Buell, New Haven, Conn.
344,345 Apparatus for converting heat energy into electrical energy; Willard E. Case, Auburn, N. Y.
344,356 Art of regenerating exhausted galvanic cells; Willard E. Case, Auburn, N. Y.
344,347 Art of converting heat energy into electrical energy; Willard E. Case, Auburn, N. Y.
344,351 Telegraph key and register; Lucian S. Crandall, Syracuse, N. Y.
344,358 Electric burglar alarm; Samuel T. Dickens, Joplin, Mo.
344,417 Connecting clip for electrical apparatus; Marmaduke M. M. Slattery, Woburn, Mass., assignor to the Sun Electric Light Company, same place.
344,425 Suspended electric conductor; Charles J. Van Depoele, Chicago, Ill.
344,430 Signal box for fire telegraph and other circuits; John C. Wilson, Boston, Mass., assignor to the Municipal Signal Co., Portsmouth, N. H.
344,467 Municipal signal apparatus; John C. Wilson, Boston, Mass.
344,505 Telegraphic instrument; George W. Stewart, New York, N. Y.
344,514 Telephone transmitter; Emile Berliner, Washington, D. C.
344,531 Electric light reflector or reflectors; Wm. A. Jones, San Francisco, Cal., assignor of one-half to George W. Percy, same place.
344,542 Dynamo-electric machine; Charles A. Parsons, Gateshead-on-Tyne, England.
344,642 Electric arc lamp; Constant Doriot, Philadelphia, Pa.
344,643 Electric motor; Constant Doriot, Philadelphia, Pa.
344,652 Electric lamp support; George J. Hammerstein, Terre Haute, Ind., assignor to the Terre Haute Electric Light and Power Company, same place.
344,679 Electric motor; Ernst F. Recordon, Paris, France.
344,693 Holder for incandescent lamps Elihu Thomson and E. Wilbur Rice, Jr., Lynn, Mass.
344,736 Electrical train brake; Hermon Hinckley, Williamsport, Pa.
344,750 Zinc for electric batteries; William S. Platt, Waterbury, Conn., Irving G. Platt (administrator of said Wm. S. Platt, deceased), assignor to the Platt Brothers & Co., same place.
344,764 Housing for electrical conductors; Arthur T. Woodward, New York, N. Y.

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Electric Light Companies and Manufacturers of Electric Light Apparatus, Supplies, &c., desiring to become members, must apply on or before August 31st, to the President, J. F. MORRISON, Baltimore, Md.

Members and others desiring information as to R.R. transportation rates will address J. F. NOONAN, Esq., Chairman Com. on Transportation, Paterson, N. J.

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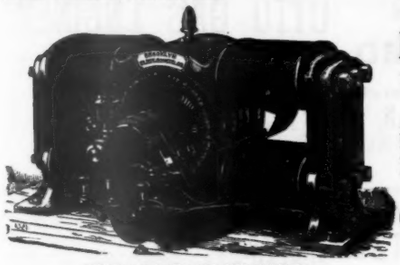

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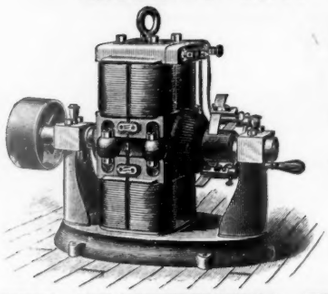

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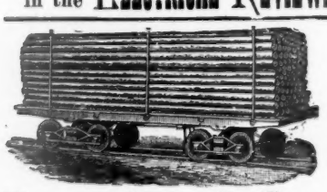

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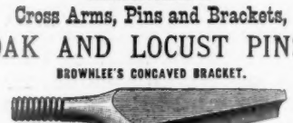

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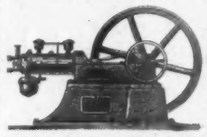

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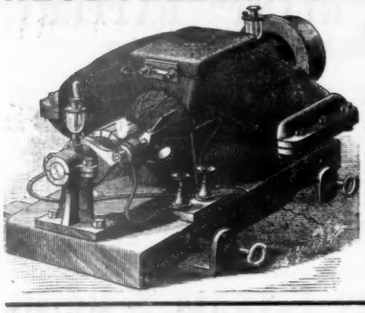

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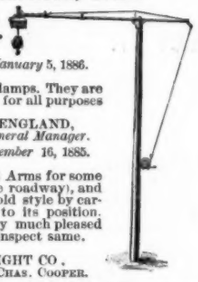

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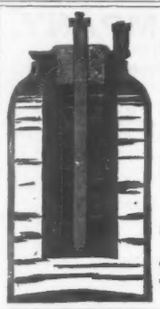

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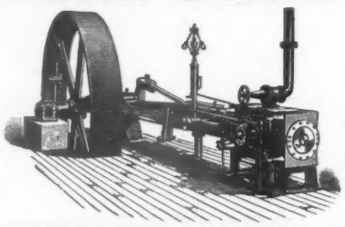

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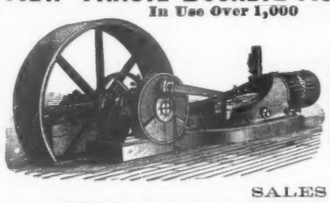

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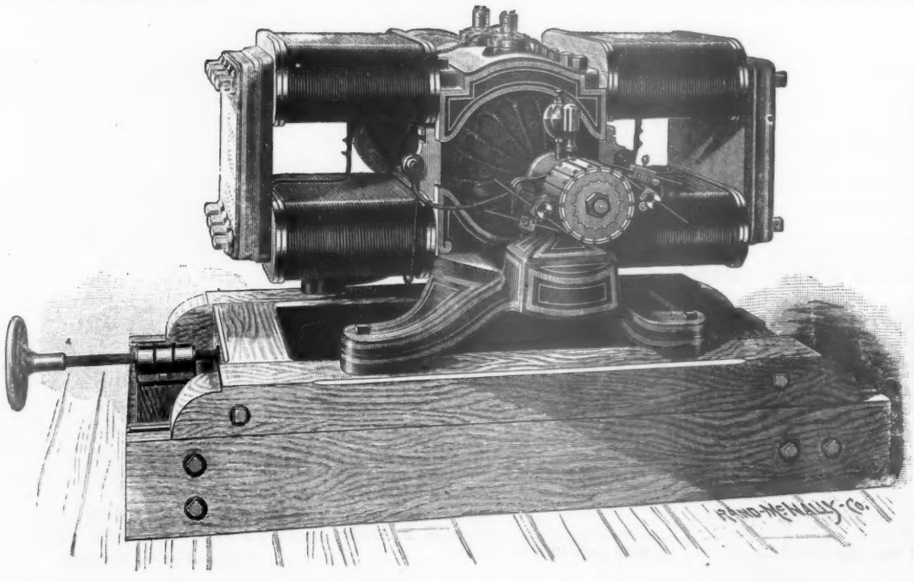

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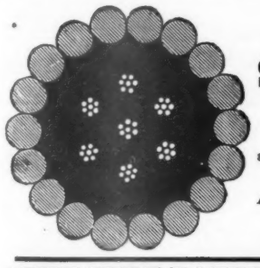

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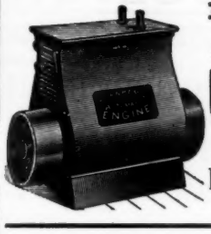

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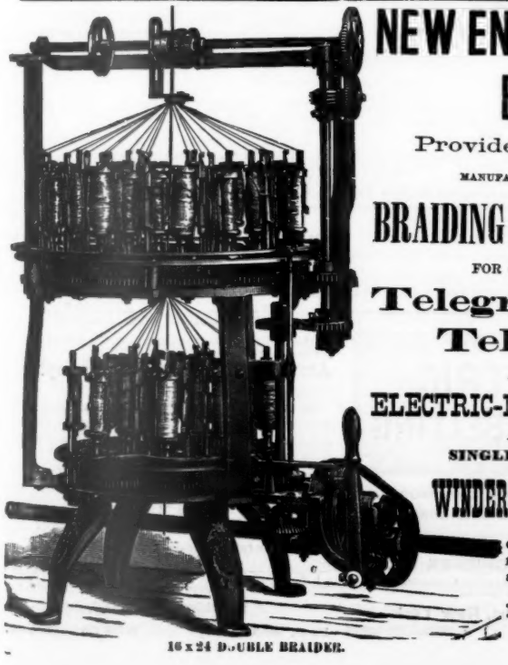

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